

ANIMAL HEALTH

A Centenary



1865-1965

THE ravages of a calamitous epidemic of cattle plague associated with the importation of animals from the Baltic port of Revel, which was to result in the death of 6 per cent of the cattle population of Great Britain, impelled the Government to set up the Veterinary Department of the Privy Council Office in October 1865.

In this book the Animal Health Division of the Ministry of Agriculture, Fisheries and Food commemorates the centenary of its forerunner and looks back on one hundred years of substantial achievement in the control and eradication of diseases of animals.

Part I is an historical review. Part II describes the work of the Division in connection with the notifiable diseases, measures taken to protect the health and welfare of animals, co-operative ventures with other bodies, and research and investigation into animal disease. Part III sets the international scene and discusses the principles and practice of veterinary preventive medicine. Over forty veterinarians have written on subjects on which they are particularly authoritative and the book is comprehensively indexed.

This wealth of recorded experience will be of great interest to all veterinarians and agriculturists. At the same time the book should become an indispensable work of reference in the field of comparative preventive medicine. It will have particular appeal to the veterinary departments of the emerging countries who, confronted with epidemic disease problems, can benefit by the accumulated knowledge gained from a century of State Veterinary Service in Great Britain.

The medallion, designed for the dust jacket by the wood engraver Cecil Keeling, depicts a centaur holding in his right hand a sprig of aloes, the medical symbol of the veterinary profession. The centaur itself, derived from the ancient Greek mythical creature 'Chiron', was later confused with Chiron, a Byzantine writer on veterinary surgery, and has remained ever since symbolic of veterinary matters.

£4 net

ANIMAL HEALTH

A Centenary

1865-1965

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

ANIMAL HEALTH

A Centenary 1865—1965

*A Century of Endeavour
to Control Diseases of Animals*

LONDON

HER MAJESTY'S STATIONERY OFFICE

1965

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BE THOU DILIGENT TO KNOW THE STATE OF
THY FLOCKS AND LOOK WELL TO THY HERDS

Proverbs 27.23

Preface

THIS book is an historical survey of Government veterinary work in Great Britain begun by the formation in 1865 of the Veterinary Department of the Privy Council, to deal with an outbreak of cattle plague, and since continued without break by various bodies culminating in the Animal Health Division of the present day.

Because the book records the actual struggle against disease, the story has been told largely from the viewpoint of the professional veterinary staff.

Part I is an historical review. Part II deals firstly with individual diseases; those chosen have all been the subject of legislation or included in disease-control schemes at some time during the past hundred years. Secondly, it describes protective and co-operative measures taken alone or in combination with other branches of the Ministry or outside bodies; it summarises the history and work of the research and investigation services, and it gives a brief resumé of legislative welfare measures. Part III sets the international scene and then discusses the principles that have been followed and the practices adopted from time to time in prevention and control of disease. The story, as a whole, is taken historically and factually to the end of 1964.

A certain degree of repetition is inevitable and, indeed, warranted where it is desired either to emphasise a point or, in the interests of the flow of the narrative, to make a particular story complete in itself.

The tale is one of unremitting endeavour sometimes, but not always, crowned with success. It is necessarily an unfinished story because there are so many continuing influences which affect the evolution of disease. Essentially, progress in the control of animal disease has proved to be a story of team-work between legislators, administrators, public health and local authorities, farmers, the general public, research workers and veterinary staff, all of whom are concerned in one way or another in the complex relationship between man, animals and disease.

Foreword

by the Minister of Agriculture, Fisheries and Food,
the Rt. Hon. Frederick Peart, M.P.

I am delighted to have this opportunity of contributing a foreword to this volume which describes the first hundred years of one of the most important and one of the oldest sections of the Ministry of Agriculture, Fisheries and Food.

The Veterinary Department—now known as the Animal Health Division—was set up by the Privy Council in 1865 to deal with cattle plague, one of the most devastating scourges ever to afflict livestock in this country. The epidemic was stamped out by September 1867 and since then the Division has had many other successes in the prevention and eradication of animal disease.

The effective control of animal disease depends on co-operation between the Division, the private veterinary surgeon, the farming community and the general public. It was indeed largely as a result of well-informed agitation in agricultural circles that the original Department was formed, and the officers of the State Veterinary Service, whether they work in the field or in the laboratory, have a close and friendly relationship with the farming community.

Throughout the hundred years of its life the Animal Health Division has maintained intimate contacts with the world outside Whitehall. The Chief Veterinary Officer is a member of the Agricultural Research Council by virtue of his office and is one of the four members of the Council of the Royal College of Veterinary Surgeons nominated by the Privy Council.

No fewer than five chief veterinary officers during their tenure of that post have been made President of the Royal College of Veterinary Surgeons, and other members of the staff have been elected to its Council. I myself have had the opportunity of seeing this co-operation in action during the eleven years in which I served on the Council of the Royal College of Veterinary Surgeons as a Privy Council nominee and I know how valuable it is.

Relations with colleagues in this country and overseas have also been very close. The veterinary staff take a most active part in professional affairs as members of the local divisions, the Council and various committees of the British Veterinary Association. Indeed, since 1938 three senior officers have been honoured by election to the Presidential Chair of the Association.

The first Head of the Veterinary Department, Professor Simonds, became Principal of the Royal Veterinary College, London, and on his retirement his successor, Sir George Brown, for a time held both appointments. This is of particular interest in an historical review, for in 1965 the post is to be filled for a third time by a distinguished leader of the State Veterinary Service.

After Sir John Ritchie retires from the post of Chief Veterinary Officer he, also, is to become Principal and Dean of the Royal Veterinary College.

The British public and veterinary science throughout the world have been well served by the State Veterinary Service and this book, bringing together as it does a century of experience, will undoubtedly be of great interest and value for many years to agriculturists and veterinarians everywhere.

Fred Peart

31 DECEMBER 1964

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Acknowledgments

THE Steering Committee for the Centenary Book consisted of:

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His colleagues on the editorial board are most indebted to the generous time freely put at their disposal by Professor L. P. Pugh, CBE, MA, BSc, FRCVS, who, although not a 'Ministry Man', has worked indefatigably in the interests of the book and has been responsible for the Historical Survey. His knowledge and experience have been invaluable.

A select bibliography has not been considered necessary in a book of this nature. The main sources of reference have been *The Ministry of Agriculture and Fisheries* by Sir Francis Floud (1927), *The Ministry of Agriculture, Fisheries and Food* by Sir John Winnifrith, KCB, (1962), and official documents which include the Annual Reports referring to diseases of animals; the Reports of Royal Commissions, Select and Departmental Committees; documents from the Archives Section of the Ministry and the Public Records Office, and the various Acts and Orders relating to diseases of animals.

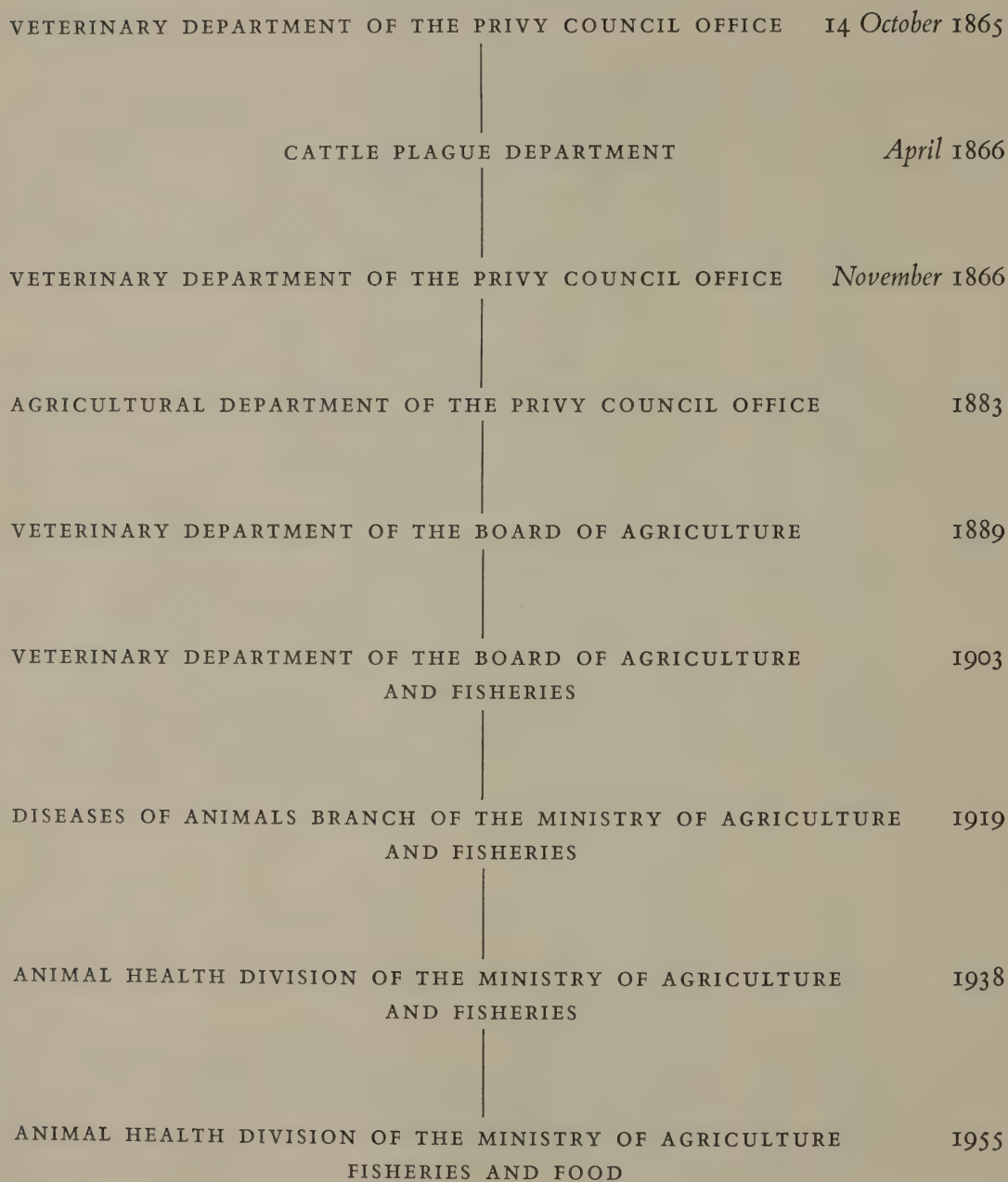
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It remains only to record that the editorial task has been a most pleasant experience because of the wholehearted support from every branch within the Animal Health Division, and from all the other Ministry divisions and Government departments which have in any way been concerned.

Abbreviations

ARC	<i>Agricultural Research Council</i>
BVA	<i>British Veterinary Association</i>
DCVO	<i>Deputy Chief Veterinary Officer</i>
DRVO	<i>Deputy Regional Veterinary Officer</i>
DVO	<i>Divisional Veterinary Officer</i>
FAO	<i>Food and Agriculture Organisation of the United Nations</i>
IVC	<i>International Veterinary Congress</i>
LA	<i>Local Authority</i>
LVI	<i>Local Veterinary Inspector</i>
NAAS	<i>National Agricultural Advisory Service</i>
NFU	<i>National Farmers' Union</i>
NVMA	<i>National Veterinary Medical Association</i>
OIE	<i>Office International des Epizooties</i>
OT	<i>Old Tuberculin</i>
PHLS	<i>Public Health Laboratory Service</i>
PPD	<i>Purified Protein Derivative</i>
RASE	<i>Royal Agricultural Society of England</i>
RCVS	<i>Royal College of Veterinary Surgeons</i>
RVO	<i>Regional Veterinary Officer</i>
STA	<i>Senior Technical Assistant</i>
SVIO	<i>Superintending Veterinary Investigation Officer</i>
SVO	<i>Superintending Veterinary Officer</i>
TA	<i>Technical Assistant</i>
TT	<i>Tuberculin Tested</i>
TVI	<i>Temporary Veterinary Inspector</i>
UN	<i>United Nations</i>
VIO	<i>Veterinary Investigation Officer</i>
VO	<i>Veterinary Officer</i>
VS	<i>Veterinary Surgeon</i>
WHO	<i>World Health Organisation of the United Nations</i>
WTVO	<i>Whole Time Veterinary Officer</i>
WVA	<i>World Veterinary Association</i>

THE DEVELOPMENT OF THE DEPARTMENT



PART ONE

The Evolution of the Animal Health Division

Chapter I

An Historical Survey

1865—1914

SO MUCH documentary evidence survives to illustrate the theme that, for the purposes of this account, the narrative must concentrate largely on the most important events and turning-points. As often in the history of a continuing movement, it is the early pioneer years which arouse the most interest: years where the foresight and shrewdness of individuals counted for more than they were to do in the later, more anonymous days of steady committee government in a more bureaucratic, centralised and democratic age.

Although the Department was formed in 1865 to deal with cattle plague (rinderpest), certain events which had occurred more than a century earlier must be recalled in order to explain the degree of unreadiness of Government in Great Britain to cope with an epidemic of this disease when it arrived, even though it was well recognised to be endemic in eastern Europe and liable to spread at any time. In the closing years of Queen Anne's reign rumours had spread through the country of the terrible losses caused by the periodical westerly migration of rinderpest. Then, in July 1714, a few weeks before George I came to the throne, a report reached those in authority that cattle were dying at Islington from a mysterious condition suggestive of plague. Great apprehension was felt by all those who realised the nature of the danger and the Lord Chancellor immediately nominated a Commission of Justices of the Peace of the County of Middlesex to investigate the trouble, along with Mr Thomas Bates, Surgeon to King George I. The Commissioners consulted with several cow-doctors (cow leeches) and, having heard all the other evidence, decided that the malady was, in truth, the much-dreaded cattle plague. On Bates' advice, the Commissioners proceeded to make some very sound recommendations. Briefly, these consisted of immediately destroying and burning all infected cattle; washing and disinfecting all cow byres 'by burning pitch, tar and wormwood' and leaving them empty for three months; fields on which sick cattle had grazed were to remain free of livestock for two months; persons attending sick animals were not to go near healthy cattle; any animals that appeared sick or off their food were to be reported immediately; the larger herds in the surrounding areas were to be split up temporarily into groups of not more than a

dozen animals. Compensation was to be paid for those who complied with these orders, and George I himself contributed the sum of £6,774 1s. 11d. as a Royal Bounty out of the Civil List. The sale of sick cattle was strictly forbidden and the Government appointed inspectors to see that these orders were obeyed. By the stern application of these measures, aided possibly by the fact that lack of roads did not facilitate quick traffic in livestock, the outbreak was under control in three months and entirely eliminated from the country by the end of the year.

In 1745 plague again broke out near London on the north side of the Thames and spread rapidly through Essex and Hertfordshire. With the King and Government fully occupied by the Young Pretender at home and Louis XV abroad, it is probable that measures to control cattle disease received less strenuous attention than they had done on the previous occasion. The first Act of Parliament for the suppression of cattle plague and for the payment of compensation was passed in 1746 but, with the extension of the war with France as far afield as India, those measures which had proved so successful in Bates' time were not adequately applied. Dealers, graziers and farmers alike were quick to take advantage of the situation, and traffic in affected cattle resulted in a rapid spread of the disease throughout the country. In 1749, the fourth year of the outbreak, compensation was paid at the rate of £7,000 per month for the cattle destroyed. The Government came to the conclusion that it could not afford this and decided 'to suspend this portion of the preventive regulations'. But, as the outbreak lingered on, the authorities became more rigorous in enforcing the law against trafficking in sick animals. On 15 October 1753, for example, a farmer of the parish of Shemping in Suffolk was fined £100 for 'buying and driving infected cattle'. His servant was fined £50 'for intimidating and preventing the inspector and parish officers from executing His Majesty's Orders and Regulations' and, since his master refused to pay the fine for him, the servant was committed to gaol. After tighter control of the regulations governing the sale of sick animals at fairs and markets the outbreak gradually died out during 1757. These had been twelve tragic years for agriculture.

When George III came to the throne in 1760 more than half the cultivated land in England was still being farmed on the open-field system. This ancient method of commonland cultivation was gradually replaced by holdings divided into separate fields which permitted better methods of cultivation and drainage with a resultant improvement of crops for fodder. This change of farming policy was one of the more important factors that supported the better selection of cattle and sheep advocated by Robert Bakewell.

During the eighteenth century the transition of English agriculture from medieval to modern methods greatly accelerated, and farming, with the development of large estates, became the hobby of the rich. Large landowners and small farmers alike, under

the stimulus of writers such as Arthur Young, developed a desire for agricultural education. Many agricultural societies were formed and shows held to demonstrate new methods and techniques. In the midst of this developing new outlook came yet another outbreak of cattle plague in the autumn of 1769. Memories of the terrible losses sustained in the earlier outbreak were still poignant and, in this age of more scientific agriculture, those in authority were in no mood to brook any evasion of responsibility by cattle dealers and farmers. George III, in his speech to both Houses of Parliament on 9 January 1770 spoke of his concern 'that the distemper amongst horned cattle has lately broke out in his Kingdom, notwithstanding every precaution that could be used for preventing the infection from foreign parts'. An Act received his Royal Assent the following month 'for indemnifying all persons with respect to advising and carrying into execution His Majesty's Orders in Council, made for preventing the spreading of a contagious distemper amongst the horned cattle'. With this rigid application of the slaughter policy by the authorities, the outbreak was quickly under control. A few months later, when the disease was reported to be on some farms near the Belgian coast, an Order in Council was issued prohibiting the importation of 'any cattle or any manner of hides or skins, horns or hoofs, or any other part of any cattle or beast, from Dunkirk or any other port of Flanders'. Fortunately no disease arrived and Britain was now, in fact, to remain clear of rinderpest for the greater part of a century.

On the Continent the continued attacks of cattle plague and the losses in horseflesh from the wars stimulated a desire for better knowledge of the diseases of livestock and their treatment. France led the way with the formation of two veterinary schools, the first at Lyons in 1762, and the other at Alfort in 1766. The Governments of Denmark, Germany, Austria and Hungary quickly followed suit. Eventually a school was started in London in 1791 but, unfortunately for agriculture generally, the only animal deemed worthy of its consideration was the horse.

Apart from epidemics of cattle plague in Great Britain, many less spectacular diseases of animals required attention for they caused considerable loss to agriculture. Sheep scab, liver rot, anthrax, swine fever and rabies all appeared to be more or less endemic and there was remarkably little information about them. This was one of the reasons why William Marshall (1745-1818) advocated the setting up of a Board of Agriculture, one of whose main functions should be the compilation of agricultural statistics. The idea appealed to Sir John Sinclair (1754-1835) and he gained William Pitt's support, so that Parliament established such a Board in 1793 with Arthur Young as first Secretary and himself as President. The Board was not a Government department; it was a society founded by Royal Charter and supported by an annual grant from the Exchequer. Under the enthusiastic drive of Young's pen a great deal of valuable information was collected and the publication of the Board's

reports did much to improve the knowledge of farmers in regard to their livestock. Officially, little was done by Parliament for agriculturists; the war with Napoleon kept everyone too busy. In any event agriculture was prospering well. 'An Act for preventing the de-pasturing of Forests, Commons and other open fields with sheep or lambs infected with Sheep Scab or Mange in that part of Britain called England' (George III, 1798) shows, at least, that someone was thinking of veterinary problems. With the end of the Napoleonic wars agriculture's prosperity faded rapidly and was succeeded by a quarter of a century of misfortune. One of the casualties of this period was the Board of Agriculture itself in 1822. In this same year Parliament found time to pass 'An Act to prevent the cruel and improper treatment of cattle' (George IV, 22 July 1822). But diseases of farm livestock, other than the horse, were still not studied or taught in Great Britain although some of the earlier veterinary graduates were beginning to press for better education in matters of animal health. In 1831 a 'Bill to Prevent the spreading of Canine Madness' enacted that when this disease was known to be prevalent it was expedient 'to prevent dogs from going at large, and to empower Justices of the Peace and others to fine the owners, and if necessary, to cause any dogs to be destroyed and also at all times to make summary compensation to the parties injured by the bite of dogs or to the owners of animals so injured'. There was still no obvious interest in the health of cattle, sheep and pigs.

In 1838 the natural successor to the defunct Board of Agriculture appeared in the form of 'The English Agricultural Society'. This strictly non-political society had as its first chairman, Earl Spencer. The Duke of Richmond when supporting him 'thought it a matter of the greatest importance that the agriculture of the country should endeavour to profit by the discoveries of science'. Mr Handley, who seconded the motion to form the Society, referred to 'the importance of the application of science to . . . the diseases of plants, of sheep and of cattle; and although the veterinary art had made some progress, they were yet [he considered] ignorant on many points'. When, at the first general meeting of the Society, its ten main objectives were defined, one of these was, 'to take measures for improving the Veterinary Art as applied to Cattle Sheep and Pigs', and a sub-committee of leading veterinarians under the chairmanship of Wm. Youatt was appointed (18 July 1838). Two years later the Duke of Richmond, as President, announced that Her Majesty Queen Victoria had granted a Charter to their Society which in future was to be known as The Royal Agricultural Society of England and that Her Majesty had graciously consented to be their Patron. A definite and happy improvement on the general agricultural front became apparent at this time, so that in later years Lord Ernle wrote '... the first 37 years of Her Majesty's reign was an era of advancing prosperity and progress in agriculture'. There is no doubt whatever that the new Society was a powerful agent in restoring prosperity and promoting a high standard in agricultural education and knowledge

for many years. The appearance of foot-and-mouth disease in 1839 and pleuro-pneumonia in 1840 drew the Society's attention to the fact that the Royal Veterinary College in London still did not take the study of farm livestock seriously, and the Society, through Mr Handley, virtually blackmailed the College into rectifying this deficiency in their teaching by financing the appointment of J. B. Simonds as the first Professor of Veterinary Pathology in the School. At the same time, graduates of the London and Edinburgh schools had been building up their demand for recognition as a profession by Royal Charter. This was granted in 1844 and the Royal College of Veterinary Surgeons started its duties.

Before 1841 there was a prohibition on the importation of animals for food purposes, but in 1842 they were allowed in, subject to duty—oxen 20s., cows 15s., sheep 3s., pigs 5s. In 1846 Sir Robert Peel removed the remaining duties and animals came in free. There was thus an obviously increased risk of the introduction of any disease that happened to be prevalent at the time on the Continent, and in 1847 sheep-pox did in fact reach England in some sheep recently imported from Germany. There was no authority directly responsible for dealing with this disease (or any other for that matter) and consequently it was spread indiscriminately throughout the country by farmers and graziers alike by their sending affected and in-contact sheep to markets and fairs. When the outbreak was well established the attention of the Committee of the Privy Council for Trade was drawn to the fact that the disease was a serious matter and was causing considerable losses to sheep owners. Although the Committee knew that there were many local bye-laws and regulations throughout the country for the seizure of diseased meat and fish it was apparently not sure to what extent, if at all, the local authorities had used or could use their powers to seize and destroy infected animals if exposed in any local market or fair. The Committee knew that the City of London had such powers but it was without precise information about the working of the City's regulations. In July 1848 an urgent circular letter to all market managers was issued in the following terms:

I am directed by the Lords of the Committee of Privy Council for Trade to request that you will, at your earliest convenience, inform their Lordships whether any, and what, bye-laws or regulations are in force in . . . market with respect to diseased or infected animals . . . exposed for sale; whether any power exists of seizing and destroying the same, and by whom and in what manner that power is exercised.

My Lords being about to introduce a Bill for the purpose of preventing the exposure of diseased sheep in the market, are anxious to collect information as to the mode of proceeding in different parts of the country.

The answers received were generally to the effect that, in those towns that had any bye-laws or regulations for the seizure and destruction of 'unsound Meat, Fish and other Provisions', none existed for the seizure and destruction of live diseased animals.

Smithfield market was the exception. The Remembrancer of the City of London drew the Council's attention to the regulations covering the duties of the market manager which read:

No. 10(6) To see that no cattle, sheep, lambs, etc. whether from disease or other cause unfit for human food, be offered for sale, and if so exposed, to seize the same according to the law.

To help the enforcement of this regulation the Court of Aldermen (21 January 1845) had appointed Mr Josiah Nice as veterinary surgeon of Smithfield market, at a salary of £50 a year. The Remembrancer went on to say 'that many horses affected with glanders have in consequence been seized and destroyed, and the veterinary surgeon is likewise called in to give his opinion as to diseased cattle and sheep, for which he is additionally paid beyond his salary as to horses'.

The assistant Town Clerk of Newcastle-upon-Tyne stated that, although they had appointed two inspectors of food under their local Act, they had never seized live diseased animals and 'it is questionable whether they possess the power to do so'. He said that their Act had been in force since 30 June 1837 and as a result of his experience of its working he would strongly recommend that if any Government Bill was introduced for this purpose they 'should empower the inspectors to enter private premises'.

The Mayor of Shrewsbury wrote:

... I regret to say there is no power under our bye-laws as to diseased cattle, sheep, horses, either to seize or fine the offenders... An Act of Parliament will be the only safe cure for the evil; bye-laws are all very well, but after many decisions of the Judges of the Superior Courts, Magistrates are afraid to act under them. ...

The Town Clerk of Cambridge went further. He said that even in the case of seizure of bad meat 'as a nuisance' an action had been successfully brought against the constable concerned and 'this result not only gave encouragement to unprincipled vendors, but materially weakened the influence of the authorities'.

Whilst awaiting the answers to this circular letter the Privy Council Committee enquired of the Commissioner of Customs '... whether the flocks of sheep imported into the other ports of the Kingdom, besides London, are examined by veterinary surgeons'. The Commissioners reported in the affirmative but concluded their reply by stating ...

as, however, there does not appear to be any legal authority for the destruction of sheep and cattle imported under such circumstances, we are of opinion that an Order in Council should be issued authorising the Officers of Customs to destroy all animals found to be infected with any contagious or infectious disease on their importation, and to detain for a reasonable time such an animal under circumstances warranting a suspicion that they may be so infected, though the disease may not appear to have broken out.

These answers, and particularly the recommendation of the Customs Commissioners, appear to have convinced the Privy Council for Trade that it should take not only stern measures in dealing with the sheep-pox outbreak but should include also, in the two Acts covering this disease, far wider powers containing provisions that could be employed immediately by Orders in Council against any other infectious disease that might gain entrance to the country as a result of free trade. There is no other explanation for the wording of parts of these two Acts.

The first Act is headed

CAP CV

An Act to prohibit the Importation of Sheep, Cattle, or other animals, for the Purpose of preventing the Introduction of contagious, or infectious Disorders, (4th September 1848).

I. Whereas it is expedient in order to prevent the Introduction of contagious or infectious Disorders among Sheep, Cattle, Horses, and other animals, that Power should be given to Her Majesty in Council to take such measures as may appear to be necessary for preventing or regulating the Importation of Animals from Parts beyond the Seas where such infectious or contagious Disorders prevail. Be it therefore Enacted by the Queen's most Excellent Majesty, by and with the Advice and Consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the Authority of the same, That it shall be lawful for Her Majesty, from Time to Time, by Order in Council, to prohibit the Importation or Introduction into the United Kingdom, or into any particular Port or Ports thereof, of Cattle, Sheep, Horses, or other Animals, either generally or from any Place or Places that may be named in Such Order, for such Period or Periods as She may deem to be necessary, for the Purpose of preventing the Introduction of any infectious or contagious Disorder among the Sheep, Cattle, Horses, or other Animals in this Country.

II. And be it enacted, That it shall be lawful for Her Majesty from Time to Time, by Order in Council, to make such Regulations for subjecting Sheep, Cattle, Horses, or other Animals to Quarantine, or for causing the same to be destroyed upon their Arrival in this Country, or for destroying any Hay, Straw, Fodder, or other Article whereby it appears to Her that Infection or Contagion may be conveyed, and generally to make such Regulations with respect to the Importation of Sheep, Cattle, Horses, or other Animals, as She may consider to be necessary in order to prevent the Introduction of any contagious or infectious Disorder.

The second Act is headed

CAP CVII

An Act to prevent, until the First Day of September, One thousand eight hundred and fifty, and the End of the then Session of Parliament, the spreading of contagious or infectious Disorders among Sheep, Cattle, and other Animals, (4th September 1848).

This Act details and empowers procedures for the seizure and destruction of sheep and other animals liable to convey sheep-pox, and for the proper control of the disease. But Section IV of the Act goes much further:

IV. And for the more effectually preventing the spreading of contagious or infectious Disease, be it enacted, That it shall be lawful for the Lords and others of Her Majesty's Privy Council, or any Two or more of them, from Time to Time to make such Orders and Regulations as to them may seem necessary for the Purpose of prohibiting or regulating the Removal, to or from such Ports or Places as they may designate in such Order or Orders, of Sheep, Cattle, Horses, Swine or other Animals, or of Meat, Skins, Hides, Horns, Hoofs, or other Parts of any Animals, or of Hay, Straw, Fodder, or other Articles likely to propagate Infection; and also for the Purpose of purifying any Yard, Stable, Outhouse or other Place, or any Waggons, Carts, Carriages, or other Vehicles; and also for the Purpose of directing how any Animals dying in a diseased State, or any animals, Parts of animals, or other Things seized under the Provisions of this Act, are to be disposed of.

Two other Sections are of interest:

Section VII. . . . That in case any Person wilfully obstruct or impede any Person acting under the Authority of this Act, or of any Order or Regulation made in pursuance of this Act, every Person so offending, and all others aiding and assisting therein, shall and may be seized and detained by such Person so acting under the Authority of this Act as aforesaid . . .

Section XIX. . . . A Person or Persons acting under the Authority of this Act or of any Order made in pursuance hereof, shall not be liable to any Action, Indictment, or other Suit or Prosecution on account of such seizure. . . .

It is obvious from these extracts that the Privy Council had taken careful note of the answers it had received as a result of its enquiries and was determined, as far as the political situation would allow, to provide powers for immediate action by Orders in Council should cattle plague or any other infectious condition gain entry to the country. Both Acts passed through Parliament without discussion except for a characteristic speech by Lord George Bentinck, the champion of protection, in which he welcomed them as the first step towards a repeal of the policy of free trade and expressed the hope that they would not be the last measures to be brought forward 'in order to render nugatory those Free Trade Acts which had been productive of so much alarm and so much mischief'.

Despite Disraeli's 'visions of deserted villages and reduced rentals' as a consequence of free trade, British agriculture, generally speaking, was never so prosperous as during the twenty-five years after Sir Robert Peel had swept away the Corn Laws. This was due partly to the important work of the RASE in educating the intelligent farmer as to how he should apply the results of scientific research, particularly in regard to the fertility of the soil, partly to the general prosperity of the commerce of the country giving rise to greater demand for better food, and partly to wars abroad temporarily eliminating some of the country's competitors. The Crimean War in 1854 put a stop to the import of Russian corn, one of the factors that had contributed to several years depression from 1849 to 1853. The Civil War in America between 1861 and 1865

limited competition from that country, whilst the Franco-Prussian War temporarily eliminated imports from France and Germany. Throughout this period, moreover, the weather was remarkably favourable, and it remained so until the end of 1874. Then trouble came to agriculture from all directions.

To return, however, to the two Acts of 1848: these were put forward as though intended to deal with the outbreak of sheep-pox but the Privy Council was careful to ensure that they were continued in operation by subsequent Acts even after sheep-pox had been eliminated. One of these continuation Acts, dated 14 July 1853, was to 'extend and continue an Act of the Twelfth Year of Her Majesty, to prevent the spreading of contagious or infectious Disorders among Sheep, Cattle, or other Animals'. This Act concentrated on the horse, whose popularity, both for pleasure and for farm work, ensured its sympathetic treatment by Parliament. After the preamble continuing the Acts, Section I states:

Any Person bringing or attempting to bring for Sale any Horse or other Animal into any Market, Fair, or other open or public Place where Animals are commonly exposed for Sale, knowing such Horse or other Animal to be infected with or labouring under the Disease called Glanders or any other contagious or infectious Disease . . . shall on conviction of any such Offence forfeit and pay any sum not exceeding twenty Pounds.

In 1854 Lord Berners drew the attention of the Royal Agricultural Society of England to the extension of cattle plague from Russia into Poland. As a result the British Government instituted enquiries through the Foreign Office to discover what measures were adopted by Prussia on her eastern frontier to prevent the spread of the infection.

The most important fact elicited at this stage was that cattle plague had undoubtedly been spread by the movement of Russian troops involved in the Crimean War. This was confirmed from both French and English army sources. Partly as a result of pressure from the RASE, but chiefly because he had been requested by the French Consul in London, J. B. Simonds interested himself in this matter. He decided to send a circular letter to all veterinary officers serving with the British Army in the Crimea, enclosing a long questionnaire. The letter read:

Royal Veterinary College
December, 1854

My dear Sir,

I have no doubt that you will readily comply with the request I am about to make, and I feel assured that you will as kindly excuse my troubling you with this communication. In my capacity of Veterinary Inspector to the Royal Agricultural Society and Professor of Cattle Pathology in this Institution, I have been requested by the Government of France, through its Consul-General, M. Herbet, resident in London, to assist in an enquiry into the causes which influence the production and extension of a disease now existing among the

cattle in Turkey, known as 'contagious typhus', which we are informed, is destroying vast numbers of the animals exported to the Crimea.

I need scarcely say that we are equally solicitous as the French Government to adopt measures to save to our brave army this essential portion of their food, and we feel that no time should be lost in the adoption of means calculated to effect this all-important object.

You will therefore much oblige me by answering the annexed queries as fully as circumstances will permit and returning the paper to me at your earliest convenience.

Trusting that amidst the trying circumstances in which you are placed, health and life will be mercifully spared to you.

I am, &c.

J. B. Simonds

Very few replies to this letter were received, but they confirmed subsequent information that cattle plague had pestered the armies during most of the war. During one nine-month period for which figures were available the French lost 8,000 cattle out of 17,500 and the British 4,000 out of 10,000.

In May 1856 Mr Blackwell, British Vice-Consul at Lübeck, wrote to inform the Foreign Office that a contagious pulmonary murrain had broken out amongst the cattle in Mecklenburg. Although he had been assured that the German veterinary authorities were confident that there was 'a distinction between Rinderpest and pulmonary murrain' he still thought the matter serious as they both appeared to him to be equally fatal. Blackwell concluded his third despatch on this subject by saying '... as this highly contagious murrain has spread from the Steppes of south Russia, through Poland, Prussia and Mecklenburg to Holstein, to a district from which the English market is supplied with cattle, I must beg leave to call the attention of Her Majesty's Government to my report of its origin, progress, treatment, and symptoms, etc., transmitted on 30 May last'. These despatches caused Her Majesty's Commissioners of Customs to put through as a matter of urgency an Order dated 24 December 1856 requiring a more rigid examination by the inspectors of foreign cattle at the ports 'with special reference to a contagious disease called *murrain*'. This led to exchanges at top level between Count Bülow and Lord Blomfield, HM Ambassador to the Court of Prussia.

Considerable uneasiness was felt at the Foreign Office about the diagnosis of this serious epidemic which might easily infiltrate to the English market with imported cattle. Therefore, on 4 April 1857, a circular letter was sent to British consular agents in northern and central Europe.

Sir,

I am directed by the Earl of Clarendon to acquaint you that the Council of the Royal Agricultural Society of this country have notified to his Lordship their intention, in conjunction with the Agricultural Society of Scotland and Ireland [sic], to send a Veterinary Professor to the districts abroad where the disease among cattle is at present raging and that the Committee

have selected Prof. Simonds for this service. I am, therefore, to instruct you, in the event of Prof. Simonds visiting any part of your district in the course of his mission, to show him every attention, and to afford him all the assistance in your power in carrying out the objects of the Societies by whom he was appointed.

I am, &c.

E. Hammond

On 22 May 1857 Simonds reported back to the societies and confirmed the opinion expressed by the German veterinarians that the so-called 'pulmonary murrain' was what he called 'contagious bovine pleuro-pneumonia' in this country. He also expressed his opinion that cattle plague would not spread to England. But Simonds seems only to have considered the spread of the disease via Germany and the Low Countries: he does not appear to have contemplated its arrival with infected cattle shipped directly to Britain from Baltic ports. During his short visit he had been most impressed by the thoroughness with which the German veterinarians 'stamped out' the disease and was therefore convinced that it would not reach Britain by spreading by slow infiltration across Europe to the Channel and North Sea ports. When eventually cattle plague reached this country he completely failed to recognise it and it apparently was left to Professor John Gamgee of the New Veterinary College at Edinburgh to make the correct diagnosis. For this Simonds never forgave him and subsequently went to considerable and doubtful lengths to prove that he himself had made the diagnosis on 10 July 1865.

In 1862 Gamgee was appointed by the Privy Council to conduct an enquiry on the subject of 'Cattle Diseases in Relation to the Supplies of Meat and Milk' and, as a result, he advocated a policy of veterinary inspection of all markets throughout the country. He also felt that the control of animal diseases could only be effectually brought about by international co-operation. To this end he conceived the idea of convening an international meeting of the leading European veterinarians and succeeded in organising a Congress at Hamburg from 14-18 July 1863. Problems connected with the control of epizootics were discussed and Gamgee returned to this country absolutely convinced that with the increase of transport by rail and ships, together with free trade, it could only be a matter of time before cattle plague would be imported. He warned Sir George Grey, Earl Russell and other members of the Privy Council. He went further and told the nation of his conviction in two momentous letters to *The Times* of 10 and 13 November 1863:

Sir,

The letter which appears this day in your columns showing the great advantages of conveying foreign cattle to London via Harwich, induces me to ask what additional precautions are being taken to prevent the introduction of diseased animals from abroad seeing that there is a

prospect of the 'largest portion of the cattle trade from the North of Europe' never coming under the notice of the inspectors of the port of London . . .

I do not seize my pen to write without weighing the effect of restrictions on trade; but, Sir, I am receiving letters by every post from all parts of the United Kingdom complaining of the condition of the lean stock, for which fabulous prices are being paid, and which is at the present time distributing diseases in all directions . . .

I am not dealing with imaginary evils when I have before my eyes as I write this letter, a statement of the losses sustained by the Russian plague in the Austrian dominions. During the last fourteen years, 500,000 animals have been seized with the disease, and of these 270,000 died. Even that loss is comparatively small when contrasted with the loss we have sustained during the last eighteen or twenty years through the lung disease; but if Russian cattle manage to reach our markets – and why should they not? – we shall certainly have more than the Austrians, whose organization for the prevention of disease among cattle is perhaps the best in Europe.

Prudent men must agree with me, that under existing circumstances we need something more than the rapid transmission of stock from foreign to British markets. We have already too much occasion to lament the introduction of foreign diseases into these islands, and we must watch lest we henceforth find that, whereas wheat barely remunerates the tiller of the soil for his labour, disease among livestock may irretrievably ruin him.

John Gamgee

Professor of Veterinary Medicine

New Veterinary College,
Edinburgh, Nov. 7th, 1863

The second letter was uncanny in the accuracy of its predictions:

If we are receiving Spanish cattle in very fine condition by sea, what is to prevent a fast and suitably built steamer landing at a British port cattle shipped at Memel or Libau? . . . We may find ourselves at no distant period much worse off for animal food than we are at present, notwithstanding every facility being afforded for free trade in stock.

Dearly bought experience has demonstrated to the Austrians, Prussians, French and others, that the importation of cattle requires constant supervision . . .

These letters had little effect in changing public opinion. Officially, the Contagious Diseases Prevention Bill, which had been extended a number of times since 1850 with various amendments, was again brought forward by Mr Edward Holland in 1863, this time amended better to meet the possibility of a cattle plague epidemic. He was unsuccessful, however, and withdrew the Bill on the understanding that Parliament would promote similar legislation in the following session.

This promise was duly fulfilled by two Bills designated the Diseased Cattle Act 1864 and the Cattle and Meat Importation Act 1864, sponsored by Sir George Grey and Mr Bruce. The first of these was a serious attempt to define with more precision what in future was to be included as 'contagious or infectious diseases' under the Act. This was done by placing glanders, sheep-pox and cattle plague (steppe murrain,

rinderpest) in Schedule I, and bovine pleuro-pneumonia and sheep scab in Schedule II. The Bill then detailed how owners of cattle would render themselves liable to heavy fines (£20 for each offence) by exposure for sale of animals affected with any of the diseases in Schedule I. Local authorities were to set apart a place within their markets or fairs wherein cattle affected with pleuro-pneumonia or sheep affected by scab could be sold. The penalty for failure to use these isolation pens was to be less severe and not to exceed £5.

Slipped into the Bill under Part I (7), without any explanation as to the reason for so doing, was the following:

If any Person gives or causes to be given uncooked Flesh for Food to Swine, or wilfully allows Swine to get uncooked Flesh for Food, he shall be liable to a Penalty not exceeding Forty Shillings.

It is intriguing to speculate on what lay behind this prescient clause which was not to be implemented for another sixty-three years.

Special provisions in the event of epidemics in cattle reaching this country were to be provided by Orders in Council which would legislate for the destruction and burial of any diseased cattle; the destruction of any parts of cattle 'as may be suspected to have belonged to diseased cattle'; the prohibition and regulation of the movement of cattle from any specified part of the United Kingdom; the examination of cattle by 'Cattle Inspectors', and the disinfection of any place or article likely to have been contaminated.

It was specifically provided that no Order in Council made under this Act should apply either to sheep scab or pleuro-pneumonia but the next section gave Her Majesty power, by Order in Council, to declare any disease not mentioned in the schedules to be infectious or contagious and thereupon subject to the provisions of the Act.

Particular emphasis was placed on the disinfection of railway trucks or other vehicles. At the same time every railway authority within the United Kingdom was to make adequate provisions for watering cattle, and they could demand 'a reasonable charge (not exceeding Twopence for each Head of Cattle) for so unloading, watering and re-loading'.

'Local Authority' was fully defined for the whole of Great Britain, and any such authority could make any regulations with respect to the examination of all cattle on their way to or from a market or fair. Also, if a local authority for this purpose appointed any officer—in this case called a 'Cattle Inspector'—he should be empowered to exclude from markets any animals deemed by him to be affected with any of the diseases in Schedule I of the Act. Moreover, any person obstructing the inspector in this work would be liable to a fine not exceeding £5. His salary was to be defrayed mostly 'out of any Rate leviable by that Local Authority'.

Finally the Bill was designed to allow the repeal of all the earlier contagious diseases prevention Acts.

The salient part of the second Bill concerning Importation of Diseased Cattle and Unwholesome Meat was contained in Part I, Section 3(6). Her Majesty might, by Order in Council, make regulations with respect to 'The prohibiting altogether for a limited Time the Importation of all or any Domestic Animals or any Parts thereof, from any Parts beyond the Seas where infectious or contagious Diseases amongst the said Animals are known to prevail . . . ' Evasion of this proposed Act might entail up to £100 fine for each offence.

The outcry which these two projected Bills evoked from graziers, dealers, butchers and importers alike, skilfully played upon by those Members of Parliament committed to strong *laissez-faire* principles, ensured once again the defeat of measures which had been carefully drawn up by men like Sir George Grey and Earl Russell who had studied all aspects of the problems.

The country was to pay very dearly before many months were past. Towards the end of June 1865 there were reports that cattle were dying in the metropolis from some mysterious condition. There was evidence that some affected animals had been in the Metropolitan market on 14 June but it was not until Tuesday 27 June that a veterinary surgeon first met the disease. On that day Mr Priestman, *vs*, was called to examine some sick cows belonging to Mrs Nicholl of Laycocks Dairy, Islington. Late the following evening, in Mr Baldwin's dairy at Hackney, he saw further cases which strongly resembled those at Mrs Nicholl's. The clinical similarity of the two outbreaks was accompanied by the same post-mortem findings; within five days twenty animals had died and similar numbers were ill. On 4 July Priestman consulted Professor J. B. Simonds at the Royal Veterinary College. After examining viscera taken from an ailing cow killed for the purpose, Simonds paid a visit to Laycock's Dairy and there carried out another post-mortem examination. Even this, combined with clinical examination of the affected cattle, did not lead to a definite diagnosis. Mrs Nicholl, in order to cut her losses, sent her cows to market or to the slaughterhouse and the disease was disseminated undiagnosed. On 10 July Simonds reported verbally to the Clerk of the Privy Council that cattle were dying in the Metropolis from an unknown cause, but it was not until 14 July that he submitted a report in writing and it was not until 24 July that any official action was taken. By this time there were eighty-two centres of infection. Then the Privy Council issued an Order in Council in which it was stated that ' . . . a contagious and infectious disorder, of which the nature is at present uncertain, has lately appeared and now prevails among cattle within the metropolis and in the neighbourhood thereof, and it is expedient to take measures for preventing such disorder from spreading. . . . ' Their Lordships, on the authority of the Act of 1848, designed primarily against sheep-pox, but with a saving

clause against other infectious and contagious diseases¹, decided that all suspicious cases should be reported to the Clerk of the Privy Council and 'that it shall be lawful for the said Clerk and for all such persons as he shall by writing under his hand authorise in that behalf, thereupon, and at all reasonable times thereafter, to inspect and examine all or any such diseased animals or animal and to report to the Lords of Her Majesty's Privy Council . . .'² It appears almost certain that Professor John Gamgee, who arrived in London on 29 July and who on that day or the next saw clinical disease in cattle awaiting slaughter, was the first person to diagnose the condition as cattle plague and to suggest that the probable source of infection was a cargo of cattle shipped from the Baltic port of Revel and landed at Hull in June 1865. The diagnosis being accepted, six Orders in Council appeared in quick succession.

On 11 August as a result of the rapid extension of the outbreak an Order in Council stated: ' . . . and it shall be lawful for such Mayor or other principal officer, and for the said justices, if he or they shall think fit, from time to time to appoint some *veterinary surgeon, or other person duly qualified*³, to be an inspector for the purposes of carrying into effect the following Rules and Regulations. . . .' The latter were those originally defined under Section IV of the Sheep-Pox Act 1848 and the continuing Acts, giving powers of inspection, seizure and destruction of affected cattle. An Order in Council dated 18 August read ominously

. . . and whereas an Order was duly made in pursuance of the authority of the said Acts by the Lords of Her Majesty's Most Honourable Privy Council dated 24 July 1865, applicable to the City of London and the Metropolitan Police District; and whereas since the making of the said Order, the said disorder appeared in other parts of England, and another Order was on 11 August duly made . . . applicable to all parts of England . . . the said disease has now appeared in Scotland and it is expedient to extend the provisions of the said Order to Scotland. . . .

The outbreak, it was clear, was getting out of hand. Acting on the 24 July Order, the Clerk of the Privy Council appointed twenty-one veterinary 'inspectors' for the metropolis with Professor J. B. Simonds as their Officer. As a result of the rapid spread of the outbreak the number of part-time veterinary inspectors soared quickly into the hundreds—and to this total must be added those 'other persons duly qualified' mentioned in the Order of 11 August.

¹ It was in the Appendix to the Report on the Cattle Plague by the Veterinary Department that the power of the Commissioners of Her Majesty's Customs to deal with foreign animals imported alive into Britain was given and regulated by an Order in Council dated 28 July 1856 issued under authority of the 1848 Act (11 & 12 Vict. c. 105). This Order, however, refers to the seizure of animals at the port of landing and could not have been applied in the 1865 outbreak.

² It will be recalled that Sir George Grey, a member of the Privy Council, was one of the sponsors of the projected 1864 Act designed to deal with cattle plague, sheep-pox and glanders as scheduled diseases.

³ Author's italics.

At a Privy Council meeting dated 22 September it was decided to issue a further Order. In this appeared:

- (6) Every Inspector shall from time to time report to the local authority by which he is appointed, the steps taken by him for carrying into effect the Regulations prescribed by this Order; and the local authority shall certify in such manner as may be directed by one of Her Majesty's Principal Secretaries of State, the number of days that such Inspector has actually been engaged in the performance of his duty, and the number of miles travelled by him thus engaged.
- (7) Every Inspector shall furnish the Lords of the Council with such information in regard to the said disorder, as their Lordships may, from time to time, require.

It must have appeared inevitable to those in central authority that when these Orders were implemented by a large number of part-time inspectors, the majority of whom would be quite inexperienced in rendering such reports, there would be chaos unless some machinery was set up to deal with their correspondence, reports and returns. It is not, therefore, altogether surprising to learn that a new department was established three weeks later on 14 October 1865 designated 'The Veterinary Department of the Privy Council Office' with Dr Alexander Williams, a medical graduate from Edinburgh, as its first Secretary. From this date an official Government department to deal with veterinary matters started and has since functioned continuously, albeit under different designations.

The following March, Williams submitted a lengthy Report to the Privy Council on 'The Origin, Propagation, Nature and Treatment of the Cattle Plague' from information received by the Department, covering the period from June 1865 to March 1866. At first sight it might appear from this that the Department had been in existence since June—that is, two months before cattle plague had been diagnosed—but in a covering letter to the Clerk of the Council, Williams made it clear that the Report which he submitted was based on information which the Department had received since its establishment on 14 October, as well as information collected by Professor Simonds from the month of June till the date of the Report. Williams stated that in July

there existed no machinery through which the Government could either have been informed of the outbreak of the disease in any given locality or by which it could have carried out the slaughter. There was, at that period, no department to which could be sent information concerning the diseases of animals, nor was there any person specially interested in giving such information.

Later the Report stated: 'It must be borne in mind that at that time, and even until a much later period, the agricultural community, as a mass, entirely disbelieved in the existence of a disease of such a terrible character as the Cattle Plague, and there is reason to believe that any stringent regulations affecting that body would have been resisted throughout the country.' Although it was well known that the stamping-out

(slaughter) policy had worked well in Germany and other continental countries, Williams was convinced that it could 'only have been carried out here by the use of strong coercive measures, and would have been, at that time, in direct opposition to public opinion'.

John Gamgee, however, had never wavered in his opinion. He had insisted from the first that there was no specific cure and he strongly advocated eradication by slaughter, compensation and the prohibition of stock movements. Just how right Williams' assessment of public opinion was, can be gauged from an editorial of *The Times* dated 6 October 1865 which read:

By the side of the many schools for the study of human diseases which were opened for their Winter Session on Monday it was impossible not to observe with satisfaction that a new Veterinary College had also been inaugurated. Here, however, for the present our satisfaction must end. Anyone who attentively perused the addresses we refer to must have been struck by the remarkable contrast between the inaugural address at the Veterinary College and those which were delivered by distinguished members of the medical profession. Although we have thought it necessary to remind the profession of their shortcomings, we must acknowledge the general excellence of the spirit in which the addresses on Monday were conceived. The lectures dwelt, for the most part, upon the many qualities of mind and of heart which were required for the successful study of the diseases of mankind; they pointed out the care and patience which were necessary to observe the numerous forms assumed by sickness; they showed how rarely, strictly speaking, a doctor could be said to cure a disease, and that in reality, he was in most cases but assisting the curative processes of Nature herself. At the same time the lecturers dilated, though perhaps, in somewhat too sanguine a tone, upon the great success which medicine had already achieved; they reminded the young students of Jenner's great discovery, by which one of the most deadly scourges that ever infected our race was deprived of nearly all its terror, and they held out the prospect of similar victories being achieved over every other sort of human suffering by the exercise of like energy. In short, they were, on the whole, proud of the past, modest in the present, and hopeful of the future. The address of Professor Gamgee presents in every respect the most opposite features. In the first place, instead of exhibiting that modest diffidence which is the best spur to future excellence, it displayed the most absolute confidence. There was not one word about the uncertainties, the peculiarities, and the diversities of disease, but a round, dogmatic declaration that the speaker and the veterinary surgeons knew all about the cattle plague, and that everybody else was ignorant on the subject. Instead, again, of referring to the labour and success of former inquiries, the address eulogized nothing in the past but Professor Gamgee's own efforts, investigations and successes; and instead of holding out the prospect of meeting disease successfully, it insisted that nothing could be done but to accelerate its ravages by slaughtering every animal that was attacked. The address, in short, was contemptuous towards the past, confident in the present, and despairing of the future . . .

After such an exhibition of the wisdom of veterinary surgeons, one may surely be permitted to ask whether the Government intend to persist in the course to which these egregious authorities have committed them. One thing at least is certain – that the measures which have been adopted have completely failed to arrest the spread of contagion throughout England

and Scotland. Nor, as our correspondent, 'SGO' lately pointed out, could it have been expected that they would be successful.

And in the same journal a few days later, Gamgee's 'importation' theory¹ that cattle plague had been introduced by cattle transported by sea direct from a Baltic to a British port was attacked:

We must say that every month's experience of this eventful year increases our incredulity respecting the theory of importation. That the conditions of the atmosphere are truly exceptional every man's senses will tell him, and we see the effect in all directions. Cholera is raging over a considerable portion of Europe, and the climate of England itself has been actually found compatible with the existence of yellow fever. Pigs have sickened, sheep have sickened, and horses have sickened. In France poultry have suffered from a strange disease and it was feared that eggs, the last resource in cases of suspected food, would be no longer safe. Now, in the face of this universal testimony to the influence of some destructive element, is it consistent with philosophical principle to assume that the disease of horned beasts is utterly unconnected with the phenomena affecting all other animal life, and that though men, horses, pigs, sheep and fowls would have suffered from the season, cows would have been absolutely exempt if a certain deck-load of cattle had not been landed at Hull from Revel?

And this was followed on 11 October in '*The Thunderer*':

Professor Gamgee, like the Cattle Plague itself, is irrepressible. As is the case, according to his own account, with animals attacked with that disease, he is wholly insensible to curative measures. We have 'exhibited' to use medical language, various remedies for the delusion with which this gentleman is possessed, but it has been to no purpose whatever. He originally broke out, soon after the appearance of the Cattle Plague, in the Marylebone Institution, and he reappeared with all the old symptoms a few days ago at the Albert Veterinary College. We then endeavoured to administer a strong dose of argument, and we were hoping that the symptoms were at least suppressed, when, partly to our disappointment and partly to our amusement, the Professor suddenly breaks out again at Sheffield in the congenial air of the Social Science Association, and the symptoms are more violent than ever. We should be very unwilling to contemplate his being subjected to the same treatment which he proposes for the cattle, and though the disorder in his mind must now be in a very advanced stage we shall yet attempt once more to administer an antidote. Though it may be ineffective in his case, it may check the spread of the disease among those to whom he may have communicated the contagion.

The Professor holds fast, in the first place to the theory of importation, and, when we have observed that he holds fast to it, that is about all there is to be said. He betrays a sublime indifference to all the arguments which have been adduced on the other side; and having simply recapitulated to his own satisfaction all of his old familiar assertions and having omitted to take any account of the objections raised to them, he concludes, like the Chairman of the Section, Dr. Lankester, that his arguments are 'unimpeachable' . . . The public, who are engaged in no such crusade against the Russians as this indomitable Professor, are somewhat less satisfied,

¹ See page 14.

and Professor Gamgee's own statement of the case would be quite sufficient to make them sceptical. As a specimen of the reasoning of veterinary surgeons it is worth careful preservation.

Professor G. T. Brown later wrote that there was at the time available

an abundant literature in Germany, the result of the investigations of competent authorities who had had to deal with outbreaks of Cattle Plague on repeated occasions and always with success. The system which they had adopted was described in every detail in various books and pamphlets; and might have been introduced in this country at once and worked out by us as effectively as it had been abroad. Instead, however, we began as if rinderpest had suddenly appeared on the earth an entirely new thing in animal plagues.

A Royal Commission was appointed in October 'fully to investigate the origin and nature of the said disorder and to ascertain as far as possible the mode of treatment best adopted for the cure of the affected animals and the regulations which may with the greatest advantage be made with a view to prevent the spreading of the said disorder and to avert any future outbreak of it'. The setting up of this Commission was probably a sound tactical move on the Privy Council's part, as Sir George Grey had had particular experience of the powers of vested interests when his Diseased Cattle Bill 1864 had been defeated. Their Lordships felt that whilst the Commissioners carried out their investigations, public opinion might be sufficiently altered to accept the more drastic measures which they were convinced would be necessary before the outbreak was brought under control.

In an interim report this Royal Commission recommended the withdrawal of the power of slaughter which had been conferred by an Order in Council in August. But by the end of the year the rapidity of spread of the disease had, if anything, increased, members of the Commission were converted to the stamping-out by slaughter method, and Parliament took the same view. In her speech from the Throne, Queen Victoria expressed 'her great concern at the extensive prevalence during the last few months of a virulent Distemper among cattle in Great Britain'. Her Majesty had, the previous September, ordered the following Form of Prayer for use in every church:

O Lord God Almighty, whose are the cattle on a thousand hills, and in whose hand is the breath of every living thing, look down, we pray Thee, in compassion upon us, Thy servants whom Thou hast visited with a grievous murrain among our herds and flocks. We acknowledge our transgressions, which worthily deserve Thy chastisement, and our sin is ever before us; and in humble penitence we come to seek Thy aid. In the midst of judgement, do Thou, O Lord, remember mercy – stay, we pray Thee, this plague by Thy word of power and save that provision which Thou hast in Thy goodness granted for our sustenance. Defend us, also, gracious Lord, from the pestilence with which many foreign lands have been smitten; keep it, we beseech Thee, far away from our borders, and shield our homes from its ravages; so shall we ever offer unto Thee our sacrifice of praise and thanksgiving, for these Thy acts of providence over us, through Jesus Christ our Lord.

The outbreak continued to extend and on 22 January 1866 the Archbishop of Canterbury felt moved to write to the Home Secretary, Sir George Grey, concerning what seemed to be a major national catastrophe:

Sir,

The continuance of the Cattle Plague with unabated severity appears to call for the appointment of a Day of National Humiliation. I am daily addressed by persons residing in all quarters of the Kingdom and entreating me to urge Her Majesty's Government to advise the Queen to issue an Order to that effect. I earnestly hope that such advice may be given, and that an early day may be appointed for such purpose.

I have, &c.

C. T. Cantuar.

Sir George replied a few days later to the effect that he had submitted the letter to the Cabinet but that Her Majesty's Government felt that it was inexpedient to adopt this course. They felt that the duty of imploring the Divine Blessing could be best carried out by the use in every church of the Form of Prayer ordered by Her Majesty in Council in September 1865.

In the meantime Sir George, Earl Russell and their many friends in the Royal Agricultural Society had been actively engaged in putting together a strong resolution to the Government for more energetic action based largely on what they had learned from the Continent. As a consequence the Cattle Diseases Prevention Act 1866 was rushed through both Houses of Parliament in one week and reached the Statute Book before the end of February.

Every local authority, as defined in the Act, was to appoint with all convenient speed such number of inspectors and other officers as it thought necessary and the certificate of such an inspector that an animal was affected by cattle plague would, for the purpose of the Act, be conclusive evidence in all courts of justice and elsewhere of its having been so affected. The inspector was empowered, at all times, to enter any field, stable, cowshed or other premises within his district where he had reasonable grounds for suspecting that cattle plague existed and if any person obstructed him in such duty the offender would be liable to a fine not exceeding £20. The inspector should, if required, state in writing the grounds on which he had entered such premises. Every local authority must cause all animals affected with cattle plague within its district to be slaughtered and must by way of compensation for every animal so slaughtered pay to the owner thereof such sum not exceeding £20 and not exceeding half of the value of the animal immediately before it was affected. All such animals were to be buried in their skins and be covered with a sufficient quantity of quicklime.

The local authority should cause premises to be disinfected and all contaminated

hay, straw, litter, dung or other articles to be burnt. The premises and fields were to remain free of animals for thirty days after such disinfection. The local authority should direct the disinfecting of clothes and the use of due precautions by the inspectors and any others in contact with the animals who might be the means of spreading the contagion. The local authority if it thought fit might cause to be slaughtered any animal that had been in direct or indirect contact with any affected animal. Such an animal could either be sold by the owner for slaughter or he could require the local authority to dispose of it and receive as compensation a sum not exceeding £25 or three-quarters of its value, provided always that the Lords of the Privy Council might reserve the animal for experimental treatment. The local authority could get one of its officers to value or the owner could elect to go to arbitration.

No compensation would in any case be paid in respect of any animal found affected in a market or on a highway or in respect of any animal moved or otherwise dealt with in contravention of this Act.

No cattle should be moved on any railway for one month from the passing of the Act.

All expenses incurred by local authorities should be defrayed out of the local rate or by a special local rate levied for the purpose, but the local authority was given the power to remit part or all that rate to any person who had sustained a loss from plague so severe as to entitle him, in its opinion, to remission. Complaints were made in some of the harder hit areas against the Order that all affected animals were to be buried in their skins; the owners thereby not only lost the value of the carcasses but were compulsorily deprived of the hides, hooves, bones and horns. They were also put to considerable burial expenses.

The Act was amended later that year to confirm certain Orders relating to payment of expenses, and an amendment of one of the Acts of 1848 gave powers to regulate movement of animals.

The effect of the Act was spectacular. During the week ending 23 February (the week in which it was passing through the necessary constitutional stages in Parliament), 17,875 fresh cases were shown in the official returns. One month later the weekly figure had dropped to 9,388 and in the comparable week in April to 4,963. In the week ending 23 November only eight fresh cases were recorded. A few sporadic cases continued to crop up in London but the country was finally declared free from cattle plague in September 1867.

When, on 14 July 1865, Professor Simonds wrote to confirm his verbal message of 10 July to the Clerk of the Privy Council 'that a contagious and infectious disorder of which the nature is at present uncertain has lately appeared and now prevails among cattle within the metropolis and in the neighbourhood thereof', he set in motion a series of actions and reactions that were eventually to lead to the formation of a

Government Veterinary Service; a service that was to continue without break in one form or another for the next hundred years. Although the sequence of these events will be traced in some detail it is by no means certain that a final judgment can be made as to the precise date of its starting. The main reason for this difficulty has arisen from the indiscriminate manner in which the word 'department' was used in those days. The Clerk's first move on receipt of Simonds' message had been to report to his Council. Their Lordships on 24 July, acting on the authority of Section IV of the 1848 Act (11 & 12 Vict. c. 107), issued an Order in Council empowering the Clerk to appoint a number of veterinary surgeons in the metropolis to act as 'inspectors' to deal with the disease in their area. One week later the disorder was definitely diagnosed as cattle plague, and by this time it had already spread to at least six counties. By another Order in Council, 11 August 1865, the Clerk was instructed to inform all local authorities throughout the country that they could, in the event of cattle plague being suspected in their areas, temporarily appoint 'Veterinary Surgeons or other duly qualified persons' to act as inspectors to help in the enforcement of the various Orders and Regulations for the control of the outbreak. Professor Simonds, who advised the Privy Council and the RASE on veterinary matters, found himself within a few weeks at the head of a large body of 'inspectors' whose numbers ran into the hundreds. Many of these men were not veterinary surgeons nor had they ever seen cattle plague; even among the veterinary surgeons there were probably only a few with any experience in diagnosing it or in dealing with an outbreak of such violence. In a very short time the Clerk and Simonds, particularly the latter, were inundated with letters and queries on the subject. The Clerk (Arthur Helps), realising that he and Simonds had no means of coping with such a mass of correspondence, sought the advice of Mr Baring (later Lord Northbrook) of the Home Office. In the meantime, he asked a friend of his, Dr Alexander Williams, if, as a temporary expedient, he could undertake to get some semblance of order into this correspondence. Williams agreed to do so and with the help of his brother and one or two clerks he set to work in a room of his private house in Spring Gardens. This was in August. By September the outbreak had spread over much of the country. Weekly returns from inspectors were required by the Council and it quickly became obvious that something more than a temporary arrangement would have to be set up. As a result of a joint effort by Mr Baring (Home Office), Mr Childers (Treasury) and the Clerk (Privy Council), an establishment was drawn up for a temporary Veterinary Department which would put the work on a more business-like basis, payment for which would be made from the Civil Contingencies Fund. This scheme started officially on 14 October 1865 with Dr Williams as Secretary, aided by four clerks (Mr Cooper, Mr Quain, Mr Tennant and Mr Sigsworth). The letter paper of this department was headed 'The Veterinary Department of the Privy Council Office (Secretary's Office)' despite the

fact that the temporary arrangement was made under the aegis of the Home Office. One must assume that, since all the inspectors had been appointed through the Privy Council, it was deemed to be more expedient to deal with the veterinary work through the 'Council Office' than through the Home Office. It was, in any case, considered by everyone at this stage simply as a temporary measure against cattle plague.

Professor Simonds and Professor G. T. Brown, his Chief Inspector, dealt with all matters requiring professional advice and the Department appeared to work well as a team.

It will be recalled that when Dr Williams handed over his first report to the Clerk he also included a covering letter dated 20 March 1866. Since this letter is a crucial piece of evidence in dating the beginning of the Government Veterinary Service in this country it is here reproduced in full.

The Veterinary Department of the Privy Council Office,
(Secretary's Office),

March 20th 1866

Sir,

IN accordance with your request, and for the information of the Lords of the Council, I have the honour to submit the following Report, on the information which has been received at this office with reference to "the origin, propagation, nature, and treatment of the Cattle Plague," *since the establishment of this Department, October 14th¹, to December 30th 1865.*

This Report also embraces information received by Professor Simonds, from the month of June to the above date, and is corrected on all points of importance, from the latest information received at this office.

Before entering upon the Report, I think it necessary to make a few remarks on the general character of the correspondence received at this office, and also upon the unsatisfactory nature of the returns sent in by the Inspectors, in order to show the difficulty there has been to select anything useful from such a mass of conflicting evidence, consisting of more than 10,000 different papers. In the correspondence, directly opposite assertions occur, not only as to the date of the outbreak of the disease, but also as to its existence, and the latter even after post-mortem examinations of the animals have been made. Referring to the inaccuracy of the reports; of 6,382 received to 30th December 1865, more than 10 per cent were so inaccurate as to prevent their being entered in the week's returns, and more than 30 per cent required correction.

Having been in communication, by letter and otherwise, with a very large number of persons who have carefully watched this disease in its progress and have endeavoured to trace it to its origin, and having found it impossible to give the results in anything like a tabular form, I have ventured to submit to you, in my Report, some remarks upon the origin of the disease in this country, which have naturally suggested themselves to me from a consideration of the information I have received. This I do solely under the impression that I am giving you, not

¹ Author's italics.

my own opinion on the subject, but the hypothesis which is most fully borne out by the evidence in my possession. I have also endeavoured throughout to avoid expressing any opinion, but have confined myself to statements embracing the whole of the reliable information which has been received by me up to the present time.

With reference to the facts and figures which will be brought before you in the following Report, I have to thank the whole of the gentlemen connected with this Department for their very energetic co-operation, night and day.

To Professor Simonds I am indebted for a careful examination of the evidence and for fixing the dates of the first outbreaks in nearly all the counties of England.

I have to thank Professor Brown for directing, arranging, and carefully digesting for tabulation the returns of the results of treatment.

For the general conduct of the office, and the entry of the weekly reports, I am indebted to Mr. Cooper, who has day and night devoted himself to the subject; Mr. Quain has tabulated the results of the treatment; Mr. Tennant has had the conduct of the general correspondence, and has also given very valuable assistance in the instruction of the Inspectors in making out their returns; and to Mr. Sigsworth has been delegated the preparation of all the statistical figures, a task which he has accomplished with satisfaction to me and great credit to himself.

Referring to my report of treatment, and to indicate to you that I have not been led to the conclusions arrived at in the Report by preconceived notions, I trust you will excuse my quoting the last paragraph of my Report to you, of August 18th 1865, which you were good enough to submit to the late Lord Palmerston, wherein I say, "So far, however, as I am able to judge from the information I have been able to obtain, I am of opinion, that by proper precautions and treatment the death rate, in this, as in analogous human diseases, may be very much reduced."

I have the honour to be, Sir,

Your obedient servant,

ALEXANDER WILLIAMS.

The Clerk of the Council.

The report was presented to both Houses of Parliament by command of Her Majesty.

A few weeks later, in April 1866, a new development took place. Lord Granville invited Colonel H. D. Harness to form a new temporary department to deal with all aspects of the cattle plague epidemic. The Colonel, who had built up a great reputation as an organiser, named this new body 'The Cattle Plague Department'. He recommended that the Veterinary Department should be absorbed into his organisation as a subordinate branch devoted almost entirely to veterinary statistics and that Dr Williams should be appointed 'medical adviser' to the new Department and that he himself should be Secretary. As a result of a conference between representatives of the Treasury, the Home Office and the Privy Council these recommendations were accepted by the Treasury and it was agreed that all the activities were to be transferred to the Privy Council Office.

There is evidence that the new organisation was not an entirely happy one. Williams, although well paid, did not approve of his post and, in fact, said he thought it to be an

unnecessary one. He was, however, overruled by the martinet Colonel. According to Sir Arthur Helps, the Lords of the Privy Council heard more plain truths from Harness than they were accustomed to and it came as little surprise that the Colonel resigned after only six months reign. In November 1866 the Treasury sanctioned the reorganisation of the Veterinary Department on its old lines with Dr Williams as Secretary, and the resumption of its original title. The following month an experienced Civil Service clerk (Charles Eardley-Wilmot) was appointed as Chief Clerk and for the next two years the Veterinary Department of the Privy Council Office worked amicably without any great alteration except that from time to time, as the volume of work lessened, the number of attached clerks was reduced.

In 1868 the Veterinary Department for the first time was entered on the Estimates as a subordinate department of the Privy Council Office. Previously all payments had been met out of the Civil Contingencies Fund, no grants being made by Parliament directly for this veterinary service other than for repayment of expenses. Treasury recognition had not been obtained without some severe cuts in salaries; the Secretary to receive annually £800 (previously £1,000), and the Chief Clerk £500 (previously £600). This had resulted from a letter dated 12 May 1868 from the Treasury to the Lord President of the Council which said:

... they are of opinion that the time has arrived when an enquiry should be instituted as to the nature of the business in that Department and whether the establishment may not be altogether abolished or at least considerably reduced.

Consequent on a suggestion from the Treasury, a Departmental Commission was appointed which considered the general state of unpreparedness of the country to deal with the risk of epidemics of contagious diseases in farm animals, the work of the Veterinary Department in this connection, and the propriety of reducing the volume of such work. This was during the period when the 1869 Act to consolidate the Orders and Regulations of the cattle plague epidemic was being drawn up. There was apparent agreement that a veterinary service must continue but some disagreement as to the permanent staff establishment. A further small Commission¹ finally agreed to recommend to the Treasury an establishment consisting of a secretary, a chief

¹ This Commission, (W. E. Forster, G. Hamilton, W. H. Clerke, A. Helps), had been appointed in consequence of a memorandum from Dr Williams, dated 14 October 1869, complaining that his office was again getting into arrears due to the increase of work resulting from:

(a) the Contagious Diseases (Animals) Act 1869, and Orders; (b) the prevalence of foot-and-mouth disease; (c) the work connected with the Transit of Animals Committee. The Commission whilst confirming that the Secretary's salary for the Department should be £800 p.a. recommended that in Dr William's case it should be put forward to £1,000 p.a. which he had been receiving - 'the extra £200 p.a. to be considered as personal to Dr Williams. For nearly the same reason Mr Eardley-Wilmot should be restored to the top of his grade viz. £600. The Veterinary Inspectors to receive £500 p.a. but in consideration of the terms under which Professor Simonds is at present engaged, he should receive £600.'

clerk, two inspectors, three clerks (first class) and nine clerks (second class), and this was accepted. The duties appertaining to the various posts were broadly defined:

1. The Secretary would be responsible to the Lord President and the Vice-President of the Council for the carrying out, under their control and supervision, the provisions of the 1869 Act, so far as the Central Office could carry out the Act.
2. The Chief Clerk would be responsible for the conduct of the general business of the office and the correspondence. He would also be expected to perform the duties of the Secretary in his absence.
3. The two Inspectors would advise the Department on all professional matters relating to contagious diseases of animals; they would visit and inspect places where disease existed or was suspected; they would also advise the Department in regard to foreign diseases, as well as those already existing in this country.

From what has been said, there would appear to be grounds to suggest that a Government Veterinary Service could have started in this country at three possible times; either:

1. on some unspecified date in August 1865 when Dr Williams agreed to do some unpaid work to help clear up Simonds' correspondence; or
2. on 14 October 1865 when, in fact, Dr Williams said the Department started and from which date he was permitted to employ four clerks to deal with all the correspondence addressed to the Veterinary Department of the Privy Council Office; or
3. in 1868 when the temporary Veterinary Department was officially 'established' under Treasury pay and appeared for the first time on 'Estimates'.

As there was no break in payment for the veterinary services from 14 October 1865 onwards, although this payment was made out of the Civil Contingencies Fund up to 1868, there would appear to be good justification for saying that the service has run continuously from that date down to the present time.

It is necessary now to return and trace events forward from the time that the 1866 Act was rushed through both Houses of Parliament in a week. There was a good deal

of criticism of the Act in the House of Lords; firstly, whether the 1848 Act had given sufficient authority to the Privy Council to issue all the Orders which the 1866 Act was now consolidating and, secondly, for the unseemly speed (despite the crisis) with which this legislation was being rushed through. The Lord Chancellor protested against the assertion that he had admitted that the course which had been taken in reference to an Order in Council was illegal, but he admitted that the Government had found itself in great difficulty 'owing to the loose manner in which the 1848 Act was worded'.

Williams, reporting to the Privy Council in 1868, observed: 'It is interesting to follow, step by step, the manner in which this conviction [the "stamping out" method] gradually forced itself upon all those who have had the opportunity, and taken the trouble, carefully to study this disease. At first only a few leading veterinary surgeons advocated this wholesale slaughter—contrary to the opinion of a majority of the medical profession.' Even the Royal Commission had been compelled to do a complete *volte-face* within the space of a few months. But everyone, even the most critical, was now forced to admit the spectacular change for the better wrought by the strict application of the stamping-out policy of the 1866 Act. The losses from the outbreak sustained by the country had been colossal, although accurate figures were impossible to obtain. Professor G. T. Brown, who was probably in a better position to express an opinion than most, declared that although owners and dairymen were ordered to give immediate notice of cattle illness to the Clerk of the Privy Council many of them 'deemed it more to their interest to conceal the disease and send their cattle to the market as quickly as possible'. He therefore placed little reliance on many of the figures of losses submitted to the Veterinary Department, particularly during the first six months of the outbreak. Officially the losses were placed as being around 300,000 cattle; but the RASE estimated that the number was almost certainly in excess of 400,000 and that, excluding the heavy indirect losses to the trade, the cost to the country in livestock alone must have been at least £5 million.

The Commissioners in their Third Report on the Cattle Plague, dated 1 May 1866, when it was obvious that the epidemic was being rapidly brought under control, thought it 'right to direct attention to the lessons taught by the history of the cattle plague during the last nine months in Great Britain, Belgium, Holland and France'—and went on to say that 'as we have seen it is difficult to extemporise legal authority and administrative machinery fast enough to cope with the ravages of a virulent contagious disease. Legal authority has now been obtained, regulations have been made, and machinery established'. But the Commissioners were well aware that the whole system was temporary, that the disease might reappear at any moment without warning and that when it did 'means ought to be ready for crushing it without a moment's delay'. To this end the Privy Council decided on a careful tidying of the

Acts, Orders and Regulations that had accumulated. At the same time their Lordships recognised that there were other serious but less spectacular diseases that would have to be taken into their consideration whilst consolidating the legislation. Foot-and-mouth disease had existed in England since its introduction from abroad in 1839; bovine pleuro-pneumonia, imported in 1840, had become firmly established and was causing serious losses. Glanders, rabies, anthrax, swine fever and sheep scab all appeared to be endemic but were generally accepted as among the many hazards of the livestock industry. Faced by the threat of four 'foreign' diseases of farm livestock it is understandable that the subject of importation, inspection and transit of animals from the Continent became one of the more serious concerns of the Council. At that time H.M. Customs had the full responsibility for animals landing in this country. On investigation it was found that there were over one hundred places (ports, sub-ports and creeks) where foreign animals could be landed. At the bigger ports veterinary surgeons were appointed as inspectors but at the smaller places where only occasional landings were made the inspection was carried out by people with little or no professional qualifications. Even at the bigger ports it was difficult to carry out satisfactory examinations since the cattle were simply driven past the veterinary surgeon standing at some vantage point. There was no adequate lairage for resting, feeding and watering the animals. If a sick animal was detected it was detained but the rest of the group proceeded on their journey and, if infected, spread the disease elsewhere. There was no machinery whereby the market inspectors might be alerted. Furthermore, arrangements for slaughtering those animals which had been detained were either non-existent or of a crude nature.

The first attempt to remedy some of these defects was made in the Contagious Diseases (Animals) Act 1867 which provided for the appointment of at least one permanent inspector for each local authority. Powers were also given to define parts of ports for the landing of foreign animals where a better chance of inspection would exist. The Act also made it possible to declare any place in which cattle plague or sheep-pox was detected 'an infected area'. It was, for the first time, made an offence to expose an animal with pleuro-pneumonia in any market or fair. This was the thin edge of the wedge that was to lead shortly to the inclusion for legislative purposes of some of the other endemic diseases already mentioned. Pleuro-pneumonia had been prevalent when cattle plague broke out but at that time its contagious nature was by no means generally accepted and little attention had been paid to its existence. It had been observed, however, that when strict isolation and control of the transit of animals took place as a result of the rinderpest regulations, the incidence of pleuro-pneumonia lessened. It could be argued that if cattle plague, sheep-pox and pleuro-pneumonia could be controlled by legislation, so could other diseases. It was the development of this idea and the experience of administering the 1867 Act that led to

the most comprehensive legislation that had so far been produced: the Contagious Diseases (Animals) Act 1869. This repealed all former Acts relating to diseases of animals and, although it did not contain detailed legislation for the prevention of the introduction of infected animals from abroad, it conferred upon the Privy Council very full powers to make any regulations it might deem necessary for this purpose and the Council made use of these powers in several important Orders. Moreover the Act included provisions for dealing with cattle plague, pleuro-pneumonia, sheep-pox, foot-and-mouth disease, sheep scab, glanders 'and any disease in this country which the Council might by Order specify'. In regard to the importation of animals from overseas, the principle of the Act was free entrance of such animals, but power was given at the same time to the Council to define specific parts of ports for the landing and slaughtering of livestock, to limit the number of ports to which these animals might be sent, and to provide better facilities both for quarantine and slaughter. In the latter part of 1869 a departmental committee was appointed to consider 'the best means of regulating the transit of animals by land and sea, in reference to both foreign and home stock'. As a result of the report of this committee a Transit Order was passed in May 1870, the provisions of which were very comprehensive. They included the division into pens of places on board ships where animals were carried, regulations for the transit of animals on railways and for the watering and feeding of them on long journeys. The disinfection of ships and railway trucks was also to be the subject of inspection. The Privy Council referred some of the problems connected with the transit of animals to the officers of the Veterinary Department and after obtaining their advice their Lordships made their recommendations. These were recorded by Williams in 1871 thus:

On a careful examination into the subject, it appeared to the Lords of the Council that the responsibility of the inspection of the Ports rested with the department of the Council Office having charge of these matters, and that *it would be advisable that the Veterinary Department should be directly in communication with the Inspectors, instead of, as heretofore, indirectly through the Customs.*¹ Their lordships also considered that the greater number of these officers should be attached to the Department, so that *their services, when not required at the Ports, might be utilised for the other purposes connected with inspection which had hitherto been neglected.*¹

Having obtained the sanction of the Treasury to this arrangement in March 1871, their lordships immediately commenced a reorganisation of the system, and, during the year, reduced the number of Ports at which foreign cattle could be landed, the number of Inspectors employed, and engaged the greater number of them at fixed salaries, with their whole time at the disposal of the department, paying, by fees, a few of them stationed at those ports at which the importation of foreign animals is small.

By this means their lordships were enabled, without additional cost, to combine the inspection at ports with the other inspection required under the Act and Orders.

¹ Author's italics.

The reorganisation was passed by an Order in Council dated 31 March 1871 and since then none but veterinary surgeons have been appointed as inspectors at the ports of landing. The instructions were amended on 29 December 1871 in the following terms:

INSTRUCTIONS to the VETERINARY INSPECTORS at the PORTS.

Privy Council Office, Veterinary Department,
Princes Street, Westminster, S.W.
29 December 1871.

Sir,

I HAVE to inform you that the regulations relating to the landing and inspection of foreign animals arriving at ports in Great Britain, dated 31st March 1871, will cease to be in operation from the 31st instant, and that after that date the following instructions relating to your duties as an Inspector of the Privy Council are to be strictly followed.

General

1. The Inspector is responsible at the place or places for which he is acting as Veterinary Inspector for carrying into effect the provisions of the Foreign Animals Order of 1871, from the time at which any foreign animals are delivered into his charge by the officers of the Customs.

2. The Inspector is also to direct his attention to the carrying into effect of the provisions of Part I. of the Animals Order of 1871, and the Transit of Animals (Water) Order of March 1871; and for this purpose he is to visit occasionally vessels carrying animals arriving at the place or places for which he is acting, and also railway stations near thereto, but he is not to incur any expenses other than those which are necessarily incurred in the inspection of foreign animals, carcases, and other things, without a previous written authority from this department in each instance.

3. The Inspector, in rendering an account of his travelling and incidental expenses, must see that every item is strictly in accordance with the scale set down in Memorandum No. 24—1871, and his account must be accompanied by a certificate to the effect that such expenses have been incurred on account of the public service, and that his attendance has been given for so many days of not less than eight hours each, or for so many days and nights of not less than twenty-fours hours each, as the case may be.

4. If called upon by the officers of Her Majesty's Customs to do so, the Inspector is to examine and certify as to the risk or otherwise of the introduction of contagious or infectious disease by any animal, carcase, hide, meat, offal, hay, straw, fodder, or other article brought by sea to the place or places for which he is acting.

5. The Inspector is to report forthwith to this department any neglect on the part of any person in carrying into effect the provisions of the Act of 1869 or of any Order thereunder.

Marking

6. The Inspector is to see that such cattle, sheep, goats, and swine within a defined part of a port as are required to be marked are marked in accordance with Article 20 of the Foreign

Copy of the
Foreign Animals
Order of 1871,
enclosed.

Copy of the
Animals Order
of 1871, enclosed.

Copy of the
Transit of
Animals (Water)
Order of March
1871, enclosed.

Animals Order of 1871, and that no animal required to be marked is taken from under his charge until so marked.

Inspection and Detention

7. The Inspector is to commence his inspection of foreign animals as soon as he conveniently can after they are placed under his charge.

8. The Inspector is to exercise his judgment whether his first inspection shall extend to an examination of each animal separately and carefully, or shall be limited to a general inspection of the whole cargo; but under any circumstances he is responsible for the effectual examination of each animal.

9. The Inspector's final inspection is to consist of a careful examination of each animal separately during daylight, and is not to take place until after at least twelve hours detention. Such detention, however, may be extended at his discretion under Article 10 of the Foreign Animals Order of 1871, but he is required to report to this department any such extra detention and the cause of it.

Contagious or Infectious Disease Generally.

10. Where the Inspector finds any contagious or infectious disease in any animal or animals under his charge, he is to give notice to the police, in order that the Inspector of the local authority may be informed thereof.

11. Where the Inspector is of opinion that any animal under his charge, not within the definition of animal in the Act of 1869, may introduce contagious or infectious disease, he is to detain such animal, and report the circumstances to this department.

Cattle Plague

12. Where the Inspector finds cattle plague in any animal under his charge, he is to detain it, and all cattle, sheep, goats, and swine brought in the same vessel therewith, and cause it and them to be slaughtered with the utmost practicable expedition at the nearest safe and convenient place.

In every such case the Inspector is to detain any animal not within the definition of animal in the Act of 1869 brought in the vessel, and report the circumstances to this department.

Pleuro-Pneumonia

13. Where the Inspector finds pleuro-pneumonia in any cattle under his charge, he is to cause the same, and all cattle brought in the same vessel therewith, to be dealt with in the following manner:

(1.) The diseased cattle are to be slaughtered at the landing-place.

(2.) The healthy cattle, if landed at any place other than within the defined part of a port, are to be slaughtered at the landing-place, or, if landed at a port at which there is a defined part, the Inspector may permit them to be removed by water into such defined part for slaughter.

Foot-and-Mouth Disease

14. Where the Inspector finds foot-and-mouth disease in any cattle, sheep, goats, or swine under his charge, he is to cause the same, and all cattle, sheep, goats, and swine brought in the same vessel therewith, to be dealt with in the following manner:

(1.) The diseased cattle, sheep, goats, and swine are to be slaughtered at the landing-place.

(2.) The healthy cattle, sheep, goats, and swine, if landed at any place other than within the defined part of a port, are to be slaughtered at the landing-place, but if landed at a port at which there is a defined part, the Inspector may permit them to be removed by water into such defined part for slaughter.

Sheep-Pox and Sheep-Scab

15. Where the Inspector finds sheep-pox or sheep-scab in any sheep under his charge, he is to cause the same, and all sheep brought in the same vessel therewith, to be dealt with in the following manner:

(1.) The diseased sheep are to be slaughtered at the landing-place.

(2.) The healthy sheep, if landed at any place other than within the defined part of a port, are to be slaughtered at the landing-place, or, if landed at a port at which there is a defined part, the Inspector may permit them to be removed by water into such defined part for slaughter.

Divided Cargoes

16. In carrying into effect Article 8 of the Foreign Animals Order of 1871, the Inspector at the place where a part of any cargo is landed is to take care that the Inspector at the place where it is proposed to land another part of such cargo is informed thereof, and each is to see that the last-mentioned article is strictly carried into effect.

Carcases

17. The Inspector may allow carcases of animals, which he is satisfied were healthy before being slaughtered, to be removed from the lairs without making a post-mortem examination of them, but he is to superintend the slaughter and make a post-mortem examination of each diseased animal.

18. If the Inspector is of opinion that any carcase under his charge, if allowed to be removed, would or might introduce any contagious or infectious disease, he is not to allow the removal thereof except for burial or destruction, and is to see that such burial or destruction is carried into effect.

19. If the Inspector is of opinion that any carcase under his charge is unfit for human food, he is to give notice to the police in order that the nuisance authority of the district may be informed thereof.

I am, Sir,

Your obedient servant,

Secretary

Of the hundred or so ports mentioned earlier, only thirty were retained and as the years went by this number was to be cut down.

The reference to the economy visualised by their Lordships brings up for consideration the actual establishment of the Veterinary Department. In 1868 an establishment of seven had been agreed by the Treasury and this staff was to be helped by temporary clerks and writers. Just before the 1869 Act was passed the Chief Clerk

was struck out of the estimates and, in fact, there seemed to be doubt in some peoples' minds as to whether there would be a Veterinary Department or not. However, once the implications of the new Act were appreciated it became obvious that the changes would add considerably to the work of the Department. The veterinary officers, who were required to make visits of inspection to ascertain whether the various Orders were being carried out, would have to send in their returns. This, in turn, would mean extra work for the central office. As a result the Chief Clerk (C. Eardley-Wilmot) was reinstated in 1869 at the top salary of his grade and reimbursed for all back pay.

Professor J. B. Simonds had been the Chief Professional Adviser from the first establishment of the Department (in fact he was advising the Privy Council before the Department existed). Professor G. T. Brown was his Chief Inspector, and the rest of the veterinary staff were those inspectors appointed by the Lord President at the bigger ports who, in their spare time, were expected to carry out duties in regard to the various diseases named in the Act. In 1871 records show that there were, besides the two senior veterinary officers, 18 whole-time veterinary port inspectors. In the same year the local authorities employed 1,450 inspectors of whom 372 were veterinary surgeons, 738 were policemen and 340 had no special qualifications. In addition there were 29 local authorities who employed policemen as inspectors under the Act, but the latter were authorised to call in veterinary surgeons when necessary. At first sight it would appear that the joint efforts of the 20 veterinary surgeons on the central staff and the 372 veterinary surgeons employed by the local authorities should have been enough to have effected some obvious improvement in the overall animal disease situation. There were, however, two factors that militated against such a result. First the point already made that, with veterinary surgeons constituting only one-third of the inspectors under the local authority, there was an inevitable delay in diagnosis and action; secondly, and more important still, the limitation of the powers of the local authority to its own district. The consequences of this second point in Professor Brown's words were:

... the modes of administration were as various as the districts were numerous and the uniformity which is essential in regulations directed to the suppression of disease was absolutely unattainable, and the system of administration was distinguished by variations from excessive severity to the extreme of laxity . . . As long as there are so many local authorities, and each of them is allowed to act independently, so long will there be difficulty in tracing the effects of legislation. [sic].

Although these points had already been well made by the Veterinary Department, investigations into them by a Select Committee were precipitated by another outbreak of cattle plague in 1872 resulting from arrival of infected animals on the ship *Joseph*

Soames which arrived at Hull from Hamburg with cattle that had come indirectly from Russia. All the animals were slaughtered on board but, as the ship was lying close to shore, it is not altogether surprising to learn that infection reached the mainland, probably carried on the clothing of the men employed in the slaughtering and in disposal of the carcasses. It was shown quite clearly at the time that cattle sold in Hull market immediately after the slaughter had been responsible for the disease breaking out in several other parts of Yorkshire. The quick suppression of this outbreak was a credit to the efficient detective work of the veterinary inspectors following up all possible contacts.

The terms of reference of this Select Committee, under the chairmanship of the Rt Hon W. E. Forster, were '... to inquire into the operations of the Contagious Diseases (Animals) Act, 1869, and the Cattle Diseases Acts (Ireland), and the Constitution of the Veterinary Departments of Great Britain and Ireland'.

As might be expected, much of the time of the Committee was taken in considering the provisions of the Act as regards the import of foreign animals and of the Orders issued by the Privy Council for putting them into effect. Witnesses representing agricultural interests urged that all fat animals from abroad should be slaughtered at the port of landing and that store cattle if not slaughtered should be subjected to a long quarantine. Butchers and dealers, on the other hand, maintained that this would discourage importation and raise the price of meat, particularly in the inland towns distant from the ports. The Committee, however, recommended that the Privy Council should continue to order the slaughter at the landing places of all foreign animals imported from countries in which cattle plague existed. Moreover, having listened to detailed evidence of the deficiencies of Hull port for landing cattle, the Committee recommended that foreign cattle should only be permitted to land at those ports at which 'satisfactory provisions had been made for their lairage, isolation and slaughter, and for the disposal of carcasses'.

Concerning the operation of the Act and Orders upon the contagious and infectious diseases of home-bred cattle, the Committee made the following recommendations:

1. *Cattle Plague:*

(a) That the slaughter of all in-contact animals by the local authority should no longer be permissive but made compulsory.

(b) That discretion should be given to the local authority to order the slaughter of any animals on any premises adjoining those in which the disease exists, upon a certificate of an inspector, being at the same time a duly qualified veterinary surgeon, that such slaughter was necessary to prevent the spread of disease.

(c) That compensation should be paid for any animal so slaughtered.

2. *Pleuro-Pneumonia*

(a) That the slaughter of all cattle affected by this disease should be compulsory, and that there should be compensation for cattle so slaughtered.

(b) That cattle which had been in the same shed, or which had been herded with diseased animals, might be moved under regulations for isolation for two months.

(c) That an inspector might apply the pleuro-pneumonia rules to any premises in which he found that it had existed within the preceding 28 days.

(d) That the pleuro-pneumonia rules should be applied to any premises in which the disease might be discovered for a period of two months.

3. *Sheep-Pox*

That the slaughter of all sheep affected with sheep-pox should be compulsory with compensation.

4. *Glanders*

That the slaughter of horses affected with glanders should be compulsory but that payment should be made to the owner for the value of the carcasses.

5. *Foot-and-Mouth Disease*

The Committee found the evidence conflicting on the actual loss caused by this disease and the best measures for dealing with it.

Some people recommended very stringent measures, such as the stoppage of all markets and fairs and the movement of animals only by licence.

On the other hand there was evidence of much weight from agriculturists and veterinary surgeons that such stringent measures would meet with strong opposition and be difficult to enforce; it would require a costly and numerous staff of inspectors, an amount of supervision by the central authority which would incite much local opposition and would so upset the home trade as to affect prices. This would induce both the producer and the consumer 'to consider the remedy to be worse than the disease'. For these reasons 'the Privy Council should cease to issue Orders for the check of this disease'. On the other hand it should still constitute an offence to expose affected animals for sale or transport. They could, however, be transported under licence for slaughter or to other premises under proper precautions.

There was general agreement among the witnesses that compensation in all cases was inadequate and that the local authorities could not expect the co-operation of stock owners 'unless fairly and liberally compensated for their loss'.

Many of the witnesses insisted upon the ill-effect resulting from a want of uniform

action by the different local authorities, both in England and Scotland, and agreed that disease regulations should cease to be 'varying or permissive' and should be uniform throughout Great Britain, as they were at that time in Ireland.

It was recommended that power of entry should be given to an inspector if he had reason to suspect any of the contagious diseases other than foot-and-mouth disease.

Many complaints were lodged by English and Scottish farmers with regard to the Irish import alleging that it had caused an increase both of pleuro-pneumonia and of foot-and-mouth disease. Without taking sides in this dispute the Committee recommended that the regulations in Great Britain and Ireland should be similar, that they should be carefully enforced at the ports in both countries and that the Irish Government should take steps, by inspection at Irish ports, to prevent the shipment of any diseased animals.

The Orders in Council relating to the transit of animals, both in respect of disinfection and the prevention of cruelty and suffering, appeared to be well adapted for their purpose; but the Committee was of the opinion that such Orders could not be carried out satisfactorily without inspection from time to time by the officers of the central authority of the vessels engaged in the Irish, coastal, and foreign trades, and also of railways, lairs, markets and fairs; and that a sufficient number of travelling inspectors should be appointed and employed by the central authority to give effect to such Orders. Beyond this firm recommendation for extra veterinary staff the Committee saw no other reason to alter the constitution of either the Veterinary Department of Great Britain or that of Ireland.

Before the Select Committee had been convened, W. E. Forster, as Vice-President of the Privy Council, received a letter dated 12 December 1872 from the Earl Cathcart (President, RASE), enclosing a 'series of suggestions in reference to the trade in animals and its influence on the spread of contagious and infectious diseases amongst farm stock'.

The Society's recommendation concerning foot-and-mouth disease was not accepted at the time, but the Society later intervened and the Order issued by the Privy Council was rescinded; on the other hand, the firm advice 'that the Privy Council should from time to time send down their own inspectors to the markets in order to see that the regulations are properly carried out' was just the support that the Veterinary Department required, and in 1874 the first travelling inspector from the central office was appointed to ensure compliance with the provisions of the Transit Order. This appointment proved so successful that further travelling inspectors were added the following year. Thus the principle of visiting inspectors was accepted and became a permanent feature of the Department.

Broadly speaking it can be said that there were three main types of Orders through

which the Privy Council tried to control diseases included in the 1869 Act. These were, Orders relating to the importation of foreign animals; Orders relating to Great Britain generally; and Orders relating to particular places, that is to say, Local Orders.

Since cattle plague was by far the most serious of the diseases affecting livestock, and was invariably imported, it is of particular interest to see how the Privy Council dealt with this problem. Because of the outbreak of 1865 the various European governments found it necessary to impose such severe restrictions on the movement of cattle from one country to another, and even within their own boundaries, that both the home and foreign cattle trade of all these countries was seriously affected. It was considered, therefore, to be of international importance to reduce the restrictions to the minimum adequate to check the disease. To this end, a second International Veterinary Congress had been held in Vienna in 1865. The most important conclusion arrived at was that a quarantine of ten days for store cattle coming from Russia was sufficient. It had been found that a quarantine of three weeks was such an impediment to trade that it led to frequent evasion of the law by the smuggling of infected animals across the frontier. In 1867 a third Congress was held at Zürich and the delegates not only confirmed their previous findings but proceeded to resolutions of a more detailed character.

The Lords of the Council from a very early date had been impressed with the necessity of obtaining immediate notification of all outbreaks of cattle plague in neighbouring countries and had therefore in 1868 asked the Foreign Office to instruct their Consuls abroad to report immediately by telegraph whenever a fresh outbreak occurred, and to make weekly reports as long as the disease persisted. The Consuls in countries free of the disease were requested to make monthly returns confirming its continued absence.

Their Lordships considered that with their powers by Order in Council, assisted by the insular position of Great Britain, they were in a far better position than any other European country to prevent the introduction of the disease provided they were warned in time to prohibit the landing of animals from infected districts; hence the paramount importance of direct telegraphic information.

In 1871 Austria-Hungary proposed an international conference at Vienna to try and work out the principles of 'an International Regulation for the control and extinction of cattle plague'. This meeting took place in March 1872 under the presidency of His Excellency Johann Ritter von Chlumetzky, Royal Imperial Minister of Agriculture for Austria, with delegates representing Austria, Hungary, Belgium, France, Germany, Great Britain, Italy, Rumania, Russia, Switzerland, Servia and Turkey. The Austrian Government, which all along had taken the initiative in this matter, delivered a note, through its Ambassador in London, to the Privy Council. Although there was general

agreement on the main issue, that of rapid international communication, their Lordships suggested several modifications of the other clauses, and it was not till 1874 that they concluded their arrangements with Austria-Hungary in these terms:

On an outbreak of cattle plague in the United Kingdom of Great Britain and Ireland, or in the Isle of Man, The Channel Islands, Heligoland, Gibraltar, or Malta, immediate notice will be given by telegraph or by special messenger to the Secretary of the Austrian and Hungarian Embassy, London, and by telegraph to the Maritime Prefect, Royal Imperial Maritime Authority, Trieste, or to the Maritime Prefect, Royal Imperial Maritime Authority, Fiume. An immediate announcement of the fact of such outbreak will be published in the *London Gazette*, and weekly notices of the state of the disease will be published in the same journal until the disease is extinguished. A copy of every such notice will be sent to the Secretary of the Austrian and Hungarian Embassy, London. All Orders of Council relating to cattle plague will be published in the *London Gazette*, and a copy thereof will be sent to the Secretary of the Austrian and Hungarian Embassy, London.

In the event of an outbreak of cattle plague in the Austrian-Hungarian empire, notice is to be sent by telegraph addressed to the Secretary, Veterinary Department of the Privy Council Office, London, by the Imperial and Royal Authorities, all ordinary official notices being forwarded in the usual manner.

Arrangements have also been made that these communications shall be as rapid as possible.

Although the Government of the Netherlands had not been represented at the Vienna Conference it nevertheless agreed to communicate by telegraph the existence of any outbreak and at the same time it expressed its willingness to co-operate in any scheme having as its object the prevention of the spread of cattle plague through western Europe. Belgium, France and Germany, however, still had their difficulties. The Privy Council refused to permit Belgian cattle to be moved inland instead of being compulsorily slaughtered at the port of landing. France, likewise, wished for relaxation, but it was considered that the existing regulations could not be modified with safety as the French frontiers, touching as they did upon Belgium, Germany and Italy (all three scheduled countries), appeared to offer facilities for the passage of infected cattle from those countries through France to England. The Lords of the Council required to be convinced that practical regulations would be enforced to prevent the possibility of cattle being surreptitiously introduced into France from these scheduled countries, before they were prepared to remove or even to relax the existing restrictions. The French Government proposed several safeguards but these did not satisfy their Lordships who stated, quite categorically, that nothing short of the measures which were enforced by the Netherlands Government would be accepted.

The German Government applied in December 1874 for the removal of the restrictions on cattle imported from their country, but again their Lordships declined to accede to the proposals. The carefully considered, but firm, answer stated, *inter alia*:

I am directed to inform you that His Excellency's letter has been most carefully and anxiously considered by the Lords of the Council, who desire me to express their thorough appreciation of the endeavours already made by the German Government to meet their Lordships' views on the subject, and of the courteous expression by Count Münster as to the willingness of his Government to adopt all those measures which may be indicated to it as necessary and desirable for the security of the interests of Great Britain in relation to this matter.

I am directed to state that their Lordships are fully impressed with the fact that Great Britain is vitally interested in preserving the greatest possible freedom to the trade in cattle, and especially in that part of it which supplies the deficiency in her home production; and that, therefore, the Privy Council would be consulting the true interests of the country, if it were to relieve the German trade from its present restrictions, provided that this could be done without increasing the risk of the introduction of cattle plague. But this does not appear to be the case. The late outbreak in East Prussia shows that even the total prohibition of the import of cattle does not prevent the passage of cattle plague over the frontier, and also that cattle may die of this disease in Germany before the German Government are aware of its existence in the country. The disease had probably existed at Sawadden for at least ten days before it was discovered; and during that time, there do not appear to have been any regulations in force to prevent the cattle from the infected districts being forwarded to Great Britain.

Had the restriction requiring the slaughter of German cattle been removed, and had these cattle been so forwarded, the risk of the introduction of cattle plague into this country would have been enormous.

Their Lordships presume that the proposal of the German Government to remove the present restrictions enforced in Great Britain on this trade, is urged in the interests of German agriculture, upon the assumption that either the cattle sent here will fetch a better price, or that a large number of them will be sent. Upon the first point it is difficult to form an opinion; but upon the second point, their Lordships would remark that according to evidence given in 1873 before a Select Committee of the House of Commons, Germany imports into her territories as many cattle as she sends to Great Britain.

If, upon the removal of the restrictions this import were increased, it must be evident that the risk of importing cattle plague would increase also.

In consequence of the action taken by the German Government and the precautions taken by the Lords of the Council in this country, cattle plague, which is so much dreaded by the agriculturist here, has not, with the single exception of the cases received through Hamburg in 1872, been imported from Germany since the present restrictions have been in force, although the import of cattle has been considerable. The advantage of this freedom from cattle plague can hardly be overestimated, whilst an increased import would be dearly bought by this country at an increased risk of the introduction of the disease.

But, in addition to the increased risk which must arise from the increased import from Germany, it must be obvious to the German Government that the concession to their request will carry with it, as an inevitable consequence, the removal of the restrictions upon the import of cattle from all those countries in which the home legislation is similar to that of Germany and the cattle of which are at present required to be slaughtered here on landing.

The wholesale removal of the present restrictions, which appears to be a consequence of an assent to the proposals of the German Government, involves a risk, the responsibility of which the Lords of the Council, under the present circumstances, do not feel themselves justified in taking.

These answers to France and Germany have been given in some detail to illustrate the very firm attitude that was adopted by the Privy Council within ten years of the 1865 outbreak.

In the Annual Reports¹ of the Veterinary Department for 1872, 1873 and 1874 pleuro-pneumonia was shown to be decreasing somewhat but it was observed that compulsory slaughter of clinical cases had not been in operation long enough to show its effects and that, in any case, both slaughter and isolation had been so ineffectually carried out that no inference could fairly be deduced as to its success in checking the spread of the disease. One factor that had caused concern to some of the local authorities was the great expense in compensation, particularly when the carcasses of cattle slaughtered, even in the early stages of the disease, had been ordered to be destroyed as unfit for human food, without the inspector of nuisances ever examining them.

On hearing this, the Lords of the Council took legal advice on the point and were informed that the owner of any animal slaughtered on account of its being affected with pleuro-pneumonia had an absolute right to the carcase, and to dispose thereof, subject to the common law, it being ruled that the medical officer or inspector of nuisances was only authorised to inspect and examine, and to form his opinion on the appearance presenting itself to him on that inspection.

There was apparently no evidence that any injurious results followed the consumption of these carcasses and, in fact, it was well known that large numbers of them were sold for food.

During this period a growing interest was taken in glanders. Professor Brown in a long and detailed account of the infectious diseases in the appendix of the Veterinary Report in 1872 said:

It is known that in some large horse establishments, a stable is set apart for those animals which have been condemned as glandered by the veterinary surgeon in attendance. These horses, instead of being sent to the slaughter-house in accordance with the recommendation of the professional attendant, have been kept in the 'condemned cell' and employed exclusively for night work. Owners of glandered animals will not give notice of the existence of the disease and unless all the horses in large establishments are placed under supervision and periodically examined by a competent inspector, it is impossible to ascertain the existence of the malady. . . . The effectual control of glanders by legislation would necessitate compulsory slaughter of all animals which are undoubtedly the subjects of the disease – whether they were exposed in a public place or found on the owner's premises.

¹ In the first quarter of each year the Minister is required by the Diseases of Animals Act to lay before Parliament a mainly statistical account of what has been done under the Act during the previous year. This 'Return of Proceedings' lists the notifiable diseases and refers briefly to major disease-control schemes. It gives details of outbreaks of disease, the cost of compensation for animals or birds slaughtered compulsorily, imports and exports of livestock and any other information which is considered sufficiently important to record. The 'Return of Proceedings' is followed by a comprehensive Report on the Animal Health Services in Great Britain which includes the work of the Central Veterinary Laboratory, the Veterinary Investigation Service, the Lasswade Laboratory and the Cattle Breeding Centre at Reading. Although the aim is to produce this report annually it is sometimes necessary to cover one

From the time of this statement there was a steady increase each year in reported cases, but even then Professor Brown was convinced that only a small percentage was being reported.

An innovation that has stood the test of time was introduced in 1875 in the form of a return of the number of places in Great Britain upon which contagious or infectious disease had been reported to have existed during the week and the number of animals attacked. This was prepared weekly by the Veterinary Department and published in the *London Gazette*. This was one of the last administrative innovations that Dr Williams, as Secretary, was responsible for putting in train, because on 19 December 1876 he announced to the Privy Council his wish to retire. Their Lordships decided that they would not attempt to fill the Secretary's post and that they would absorb much of the departmental office work into their main office. The Vice-President of the Council in announcing this went on to say:

It is, however, indispensably necessary that the Council office should be provided with the best available professional assistance, and the known ability and experience of Professor Brown point to him as an Authority upon whose advice the Office can rely with safety. The Council office will therefore look to Professor Brown for such professional advice as may be required and Professor Brown will understand that he may, whenever it is necessary, communicate with me directly through the Clerk of the Council.

Until this date Professor Brown had, from the time of Professor Simonds' retirement in February 1872, continued to act as Chief Inspector of the Veterinary Department with A. C. Cope as next in seniority. During this period Simonds had been asked by the Privy Council to make his services available in a consultative capacity whenever necessary, for which he would receive one guinea each time he was consulted.

Reporting on the year 1876, Professor Brown drew attention to the prevalence of foot-and-mouth disease on the Continent, evidenced by the fact that 9,359 animals so affected had been landed in this country. As the disease was still more or less endemic in Great Britain the report did not seem to cause undue alarm.

He observed that the action of the local authorities seemed to be having some effect in controlling pleuro-pneumonia but he still felt that 'a large proportion of stock owners do not find it conducive to their interests to act in concert with the officials who are appointed to carry into effect the necessary sanitary regulations.'

Sheep-pox had been detected on one occasion in a cargo of sheep landed at Deptford but no extension of the disease occurred.

Cattle plague had not appeared since the outbreak in Yorkshire in 1872 and the

or two years in one volume. The object of the Report is to provide a permanent record of the work done by the Ministry in the field of animal health. It has a very wide circulation both in this country and overseas and it constitutes a valuable source of reference.

legislation on the Continent appeared to be confining the disease to certain countries, but the Professor warned his readers that the increased facilities for the transit of animals by railway and ship from the countries where cattle plague was frequently prevalent increased the risk of the introduction of the disease to Great Britain. On two occasions affected cattle had been landed here before official notice had been received of the existence of the disease at the place of export. It was evident, therefore, that we could not rely on international regulations for security against foreign diseases:

One important argument, [he said], in favour of slaughter at the ports may now be adduced which could not have been urged a short time ago. The problem how to carry meat in all states of weather has been to some extent solved by the American system of transit. . . . Our experience is yet too limited to enable us to determine to what extent it would be possible to substitute a dead meat trade for importation of livestock.

On the ground of humanity as well as economy, the advantages of the system of slaughtering animals at the great centres of production are evident enough . . . it will not be surprising if the system of universal slaughter of all animals intended for food shall be advocated as more economical and humane than the most approved method of transit of livestock.

Little was he to know that his views were to be tested to the full within the space of a few months, because cattle plague was re-introduced into England in 1877 by cargoes of infected cattle from Hamburg which were landed in London and in Hull. The disease spread rapidly in the metropolis despite the efforts of the local authorities, and the Privy Council decided to deal with the disease from the Central Department. In this work the travelling inspectors, whose duties had up to then been mostly limited to transit regulations, rendered outstanding service, and the outbreak was extinguished within a few months.

The importation of cattle plague for the third time in twelve years led to the setting up of a Select Committee in 1877

to inquire into the causes of the recent outbreak of cattle plague and the measures taken for its repression; and into the effect which the importation of live foreign animals has upon the introduction of disease into the country and upon the supply and price of food.

The evidence given before this Committee had two important results. Firstly, it focused attention on the loopholes in the 1869 Act and led, as a consequence, to the passing of the 1878 Act which was far more comprehensive in its provisions than any previous enactment. Secondly, it drew attention to the development of the dead-meat trade and the extremely important possibility of avoiding most of the risks of importing foreign animal diseases. One can trace the hand of Professor Brown on the second point.

After hearing a great deal of detailed evidence the Committee summarised its findings as follows:

1. That as a statutory arrangement the importation of all animals from Russia, and of cattle from Germany (except Schleswig-Holstein) and Belgium, be prohibited, whilst that of other animals from these last two countries, and of all animals from the rest of Europe, should be subject to the provisions of the same schedule; *power being reserved to the Privy Council to prohibit the importation of animals from other countries if they think fit.*¹ An exception, however, should be made in favour of store and dairy animals, provided they remain in quarantine for fourteen days, and afterwards are placed under inspection for two months.
2. *That the Privy Council should be empowered to deal directly with the cattle-plague whenever it appears in this country,*¹ and that for this purpose it should receive from the local authority immediate notice of every outbreak.
3. That the power to order the slaughter of animals suspected of cattle-plague should extend to animals in premises adjoining to the infected premises.
4. That whilst the compensation for the slaughter of animals affected by cattle-plague should remain as it is at present,² the compensation for the slaughter of animals suspected of that disease should be the full value (not however exceeding £40).
5. That all compensation for the animals so slaughtered, whether diseased or suspected, should be defrayed from imperial funds.
6. That in case of pleuro-pneumonia or foot-and-mouth disease breaking out, *the Privy Council should have power to fix the limits of the district which is to be treated as infected.*¹
7. That uniform rules applicable to all districts declared infected should be issued by the Privy Council, but should be enforced by the local authority, subject to the supervision of the Privy Council.
8. That, in the case of pleuro-pneumonia, the compensation for the slaughter of animals, whether suspected or diseased, should be at the same rate as in the case of cattle-plague, but should be payable out of local funds.
9. That stock exposed in Islington Market should not be allowed to leave the metropolitan district alive.
10. That, in the metropolis and large towns, dairy and cattle sheds should be subject to registration, inspection, and regulations.
11. That the restrictions applicable to Great Britain should be extended to Ireland and the Channel Islands, or else that ports should be specified in Great Britain by the Privy Council, to which alone importation of live animals from Ireland and the Channel Islands should be lawful, the animals not being permitted to be taken inland unless examined and passed by a Privy Council inspector at the port of debarkation.
12. And your Committee are of opinion that no further restrictions should be placed on the importation of foreign animals in respect to foot-and-mouth disease and pleuro-pneumonia, unless at the same time, orders be enforced throughout Great Britain that in every district where either pleuro-pneumonia or foot-and-mouth disease exist, and which has been declared by the Privy Council to be infected, all movement of cattle be prohibited except under license; that fairs and markets be under similar restrictions, and that absolute prohibition of movement be enforced against infected farms for periods varying from two months in pleuro-pneumonia to twenty-eight days in outbreaks of foot-and-mouth disease.

¹ Author's italics

² That is to say at half the healthy value

The recommended increase in compensation for the slaughter of suspected animals which was to be paid out of imperial funds was to be 'deemed a cheap insurance against what would otherwise become a national misfortune'.

Professor Brown had advocated amendments of the existing system in order to establish uniform regulations applicable to the whole country. Such regulations were to be issued by the Privy Council and to be carried out by the Privy Council inspectors in each district. He had, however, been unable to carry the Committee all the way with him and they decided that the appointment of inspectors should remain with the local authority, subject to the supervision of the Privy Council.

The 1878 Act, based on these findings, reinforced the necessity for slaughter of animals at specially selected ports. Quarantine was to be limited to animals imported for exhibition or for some other special purpose which the Privy Council would control by Order. Cattle plague in future was to be dealt with centrally. Slaughter by local authorities of animals suffering from pleuro-pneumonia, and compensation for the owners, was made compulsory and powers were given to slaughter cattle which had been exposed to infection. Stricter provisions in regard to 'infected areas' were made, particularly dealing with foot-and-mouth disease. Very wide powers were given to the Privy Council 'for the purpose of in any manner preventing the spreading of disease'. Advantage of these provisions was taken by Orders to deal very stringently with swine fever, anthrax and rabies, the work being done by local authorities under constant supervision by the central department through its travelling inspectors.

The second main result of the inquiry by the Select Committee, that of dealing with the dead-meat trade, (a topic raised by Professor Brown in his report for 1876), was so important that it appears necessary to digress somewhat from the main theme of this survey to give some factual information on the reasons which had led to the development of this trade.

Due to the expanding population and the greater prosperity of the nation following the growth of the manufacturing industries, more demands were made for meat than agriculture could produce. This shortage had been discussed as far back as 1863 by the Privy Council, and had become increasingly serious. The deficiency had been met by importations from the Continent but these had, unfortunately, also introduced disease. Elsewhere, in America, Australia and New Zealand, there existed a virtual glut of cattle and sheep. To meet this situation Australia pioneered the tinned-meat trade, exporting to Britain in 1867, 286,526 pounds of meat, two years later exporting 2 million pounds and, in 1880, 16 million pounds of tinned beef. This trade in tinned meat had received a considerable stimulus during the Franco-German war. No American meat of any kind was imported here during the 1860's, but early in the 1870's live cattle began to arrive from USA in increasing numbers. The losses in livestock during these voyages were at times enormous and, of course, added to the cost of the meat. This, briefly, was the

setting of the scene for the start of the dead-meat trade—a development that eventually exerted a most profound effect on the veterinary service in this country.

In 1838 Thomas Sutcliffe Mort, a native of Bolton, Lancashire, emigrated to Australia and became a pioneer in the experimental study of artificial cold and ice production; in 1861 he established the first freezing works in the world at Darling Harbour, Sydney. It is certain that even if their Lordships of the Privy Council had heard of this they could hardly have foreseen that it was the first of a series of events that would eventually lead to the solution of their meat-deficiency problems.

Another pioneer, James Harrison, an emigrant from Glasgow to Australia, was at the same period experimenting on the effects of refrigeration on meat, and in 1873 he exhibited his cold-producing machine, filled with frozen beef, poultry and fish. Six months later he used these same meats to regale business friends at a public banquet and convinced his guests of the great future that awaited the development of his ideas.

In Great Britain two brothers, James and Henry Bell, had approached the problem from a slightly different angle and they consulted Sir William Thomson (later Lord Kelvin) on the soundness of a mechanical device they had developed by which they hoped to produce a steady low temperature for commercial purposes. Sir William, who had other, more pressing, problems to deal with, introduced them to a Mr J. J. Coleman who soon joined them in partnership to form the Bell-Coleman Mechanical Refrigeration Company. They took out a patent for their machine in 1877. They had been forestalled by Mr T. C. Eastman of New York who had worked on the same principle and who in 1875 shipped the first cargo of 'chilled' beef successfully to this country, and to him must be given the credit for this innovation. A baron of this beef was sent to Her Majesty Queen Victoria who pronounced it to be 'very good'. John Bright is said to have been so impressed with the quality of this beef that he maintained a weekly order of it for his table.

The first ship to be fitted with the Bell-Coleman patent was the S.S. *Circassia* of the Anchor Line and she started in the American trade in 1879. In the meantime the Bell-Coleman Company constructed an experimental building at the engineering works of D. W. Henderson and Company of Glasgow, reproducing as closely as possible the conditions likely to be met in a ship, and it was demonstrated clearly that beef kept chilled at 30°F emerged in excellent order months later.

The same firm also equipped the S.S. *Strathleven*. She left Plymouth in 1879 and returned from Australia with forty tons of beef and mutton, arriving at London Docks on 2 February 1880. This was the first successful cargo from the Antipodes. The first New Zealand shipment to reach London without mishap was carried by the S.S. *Dunedin* on 24 May 1882.

Before returning from this digression to the findings of the Select Committee it is

of interest to record the peroration of a speech delivered by Thomas Mort at an inaugural lunch connected with his business to 300 guests on 2 September 1875. It has a contemporary ring that appears to justify its repetition here. He said:

I feel, as I have always felt, that there is no work on the world's carpet greater than this in which I have been engaged. Yes, gentlemen, I now say that the time has arrived – at all events is not far distant – when the various portions of the earth will each give forth their products for the use of each and of all; that the over-abundance of one country will make up for the deficiency of another; the super abundance of the year of plenty serving for the scant harvest of its successor; for cold arrests all change. Science has drawn aside the veil, and the plan stands revealed. Faraday's magic hand gave the keynote, and invention has done the rest. Climates, seasons, plenty, scarcity, distance, will all shake hands and out of the comingling will come enough for all. for 'the earth is the Lord's and the fulness thereof', and it certainly lies within the compass of man to ensure that all His people shall be partakers of that fulness. God provides enough and to spare for every creature He sends into the world; but the conditions are often not in accord. Where the food is, the people are not; and where the people are, the food is not. It is, however, as I have just stated, within the power of man to adjust these things, and I hope you will all join with me in believing that the first grand step towards the accomplishment of this great deed is in that of which you yourselves have this day been partakers and witnesses.

The Select Committee heard a great deal of first-hand evidence on the American meat export trade and was obviously impressed by its possibilities. It decided, all the same, to be very cautious and concluded that the trade was at a too uncertain and experimental stage to justify reliance upon it for an unfailing supply. The veterinary evidence had been a little more optimistic than this. John Gamgee, who had spent the best part of ten years studying and experimenting on the refrigeration of meat, had no doubt that the American supply would be more than sufficient to meet all our needs

especially if we adopt rational means of preventing gluts and preserving meat when it arrives – not doing as I have seen in London on Pickford's vans, a heaping-up of mountains of beef which had been so carefully carried by the Americans to our ports – with men sleeping on top of the meat – and with a vertical sun, sometimes 80° in the shade, operating to injure the meat.

He wanted to see the livestock trade as it was in 1835 and not with a policeman at the cow's tail everywhere, and without magistrates having to sign movement orders from ten in the morning to ten at night. With the imported meat, he argued, we could close our ports to live animals, develop our home cattle trade and return once again to a really healthy stock. He gave his opinion that the importation of our extra requirements in the form of chilled beef would probably give security against the introduction of foreign animal diseases. Gamgee knew nothing of the ability of some ultra-visible viruses to withstand chilling for long periods but some intuition seems to have made him insert the word 'probably' in his statement.

Professor Brown was asked this question—‘Supposing the importation of dead meat as well as live cattle from affected countries in Europe was prohibited. Would we be able to receive an undiminished supply of dead meat from America?’ His reply was, ‘Undoubtedly’. His answers to the Select Committee give one the impression that he had made up his mind that, as soon as it was practical, the importation of live animals for food should as far as possible be stopped and the deficiency made up with chilled or frozen meat. In the meantime the strictest enforcement of the Privy Council’s Order for slaughter at the ports must continue to be the policy against foreign cattle disease.

It will be recalled that the Select Committee (1877), after considering the effect which the importation of live foreign animals had upon the introduction of disease into Great Britain, recommended that no further restrictions should be placed on the importation of such animals in respect of foot-and-mouth disease and pleuro-pneumonia unless, at the same time, measures were put in force in Great Britain to control movement of cattle in districts infected by either of these diseases. This recommendation, which had been included in the 1878 Act, was amended in the subsequent Act of 1884 in such a way as to enable the Privy Council to prohibit the landing of animals whenever it was satisfied that foot-and-mouth disease might be introduced either directly or indirectly. At the same time, another Act (the Contagious Diseases [Animals] Transfer of Parts of Districts Act), gave to a local authority the power to transfer to another local authority the whole or part of its district for the more efficient enforcement of the existing regulations.

In 1878 swine fever, which had been endemic in this country for many years, suddenly flared up and, as a consequence of the representations of the local authorities, the Privy Council passed an Order at the end of the year to allow the compulsory slaughter of all affected pigs. This Order was enforced with great vigour and enthusiasm by the authorities and Professor Brown expressed the opinion that they would probably wish to extend the slaughter policy to all pigs that had been herded with the diseased ones. Moreover, he considered that they would want to increase the length of time that the premises should be deemed infectious.

Two other diseases which were made notifiable in 1886 were rabies and anthrax. Rabies was known to have existed for centuries. The frightful character of hydrophobia in man, long since associated with the bite of a mad dog, had even led to the practice of euthanasia in man, certainly up to the end of the seventeenth century—the victim usually being suffocated under a heavy feather mattress. Prognosis is no better in the twentieth century but mercifully there are, at least, drugs that will ease the end. Dogs had been excluded from the 1878 Act on the grounds that they were not agricultural livestock; the introduction of the Contagious Diseases (Animals) Act 1886 gave power to the Privy Council to include dogs among the animals to which the 1878 Act

could be applied and in January 1887 an Order, which was generally permissive, was made under the Act. It allowed local authorities to make regulations for the muzzling of dogs; for keeping dogs under control; for providing for the seizure and detention of dogs straying unmuzzled or not under control; and, where dogs were at large and affected with or even suspected of rabies, for their seizure, detention and, if necessary, destruction. It made it obligatory to report suspected cases to the police and for weekly returns to be made of such cases. The carcasses of animals that died of rabies were to be destroyed. The law at that time conferred no general power upon the police to capture stray dogs unless they were dangerous or were found in a district in which, by the existence of rabies, an Order had been made by the local authorities under the aegis of the Privy Council. The Council, however, was advised that it had not, and could not confer, the authority to destroy stray or ownerless dogs. In these circumstances a Select Committee of the House of Lords was appointed in 1887 to enquire into and report upon the subject of rabies in dogs and the laws applicable thereto. One of the more impressive pieces of evidence given to this Committee was in connection with the methods that had been employed successfully in Germany. In 1875 the Prussian Government had passed a law which provided that all dogs suspected of rabies should be immediately killed, as well as any animals known to have been bitten by such dogs; and that all dogs in a district which had been subjected to an outbreak of rabies should be confined or, when taken out, should be both muzzled and on a lead. The German veterinary authorities were of the opinion that this law, combined with the general muzzling order, had entirely eliminated rabies from Berlin. The Committee, however, broadly speaking, was convinced that a general muzzling order throughout the country would be extremely unpopular and finally agreed to make the following recommendations:

1. that when rabies is prevalent the muzzle should be enforced;
2. that the power of the Privy Council should be extended to authorise the slaughter of stray dogs;
3. that symptoms of rabies should be endorsed on dog licences;
4. that the local authorities should have power to order that dogs should wear badges which may identify their owners;
5. that in populous places, local authorities should place restrictions upon dogs generally, and especially deal stringently with apparently ownerless dogs in their districts;
6. that in the event of its being conclusively proved that M. Pasteur's system provides a preventive remedy, facilities should be afforded for its application in England.

Regulations involving dogs have tended, at most times, to become complicated by the sentimental attachment of their owners for their friends' comfort and welfare and even to become political dynamite. Rabies regulations were to prove no exception to this tendency during the next fifteen years.

The third disease scheduled by Order in 1886, anthrax, had also existed here from remote times. It came into prominence when a scientific investigation into wool-sorters' disease placed the cause beyond any doubt, proving it to be identical with anthrax, and showing that men became infected by handling wool from animals which had died from the disease.

Professor Brown, in a report on anthrax to the Government in 1881, pointed out that legislation could not prevent the foreign exporter from mixing inferior wool removed from anthrax carcasses with best-quality wool, and, in order to detect this fraud, it would be necessary to sort the wool while in the charge of the Customs—a proceeding that would merely divert the risk of disease from the workers in the factory to the examining officers at Customs and which would require these officers to become skilled wool-sorters.

However, hopes were raised high in the same year by Louis Pasteur when he addressed the members of the International Medical Congress in London on 8 August 1881 during which he presented conclusive evidence that sheep could be given complete protection from anthrax by a previous injection of an attenuated vaccine. At the end of his dissertation he said:

I cannot conclude, gentlemen, without expressing the great pleasure I feel at the thought that it is as a member of an international medical congress assembled in England, that I make known the most recent results of vaccination upon a disease more terrible, perhaps, for domestic animals than small pox is to man. I have given to the term vaccination an extension which science, I hope, will accept as a homage to the merit and the immense services rendered by one of the greatest men of England, Jenner. What a pleasure for me to do honour to this immortal name in this noble and hospitable city of London.

The Veterinary Department of the Privy Council Office from its commencement in 1865 had developed steadily for the next fifteen years. During this period their Lordships appeared to have paid considerable respect to Professor Brown's professional advice. From the time that he took over control from Professor Simonds in 1872 he had consistently taken the line that, although many local authorities did their best, there were such variations shown by neighbouring authorities in the administration of the Council's Orders as to render many of the regulations nugatory. He also made it quite obvious that he thoroughly distrusted dealers, butchers, graziers and many farmers—contending that their only consideration was their own purse, and that they seldom showed any qualms at sending infected animals all over the country if it suited their purpose. He wanted to see qualified veterinary surgeons at all key-points to supervise the activities of the local authorities' inspectors, many of whom had no veterinary qualification. He was responsible for the development of the idea of travelling inspectors which had been suggested originally by the RASE in 1872, and he was entirely in favour of central control as far as animal diseases were concerned.

Unhappily, from 1874 onwards, agriculture generally had struck bad times and was, by 1880, in a state of acute depression. As a result a good deal of dissatisfaction had been expressed about the control of what was after all the country's greatest industry.

It was in this mood that Sir Massey Lopes set in motion activities that were ultimately to lead to reforms in the government of agriculture which, in their turn, affected the development of the veterinary services of the country. On 13 May 1881 Sir Massey moved in the House 'that it is desirable that the functions of the Executive Government which especially relate to Agriculture and Commerce should, as far as possible, be administered by a distinct department, and be presided over by a responsible Minister of the Crown'. On introducing the matter he said that it had been frequently discussed before in that House and 'carefully considered' by successive governments for the last twenty years! He sincerely hoped that he would not receive from the Government the usual stereotyped answer or some vague assurance that the question would be studied in due course. On previous occasions they had proposed that the Minister should be of Cabinet rank, but he did not now press for this condition. Why, he asked, was England the only important country that had not a responsible Minister and a distinct Department to supervise these two important interests? The United States, our chief competitor in all agricultural produce, had a separate Department of Agriculture. The various duties of the different departments connected with agriculture and commerce were absurdly incongruous. Their affairs were distributed over so many departments of the Government which had no relation with one another that it was impossible to get information without great inconvenience and loss of time. For instance, if one wanted to get any information about the diseases of cattle he was referred to the Minister who looked after art and science, education and religion; if one wished to hear something about agricultural statistics he was referred to the Minister whose main duty it was to look after railways and ships, and so on. What they really wanted was one Minister with two separate or distinct departments, each possessing separate and permanent official staffs and one of these departments should deal exclusively with agricultural subjects; he would also like to see a Parliamentary Secretary attached to each department. He reminded the House that John Bright in 1869, when President of the Board of Trade, had strongly recommended this course, and that ten years later a majority of the House declared in favour of the principles which he was now advocating.

W. E. Gladstone said he was satisfied with the proposal now that they had left out the condition about Cabinet rank for the Minister. He proceeded, however, to disagree with some of the statements made by Sir Massey:

there is nothing in the United States like a Minister of Agriculture and. . . the Agricultural Bureau is simply statistical. . . I am informed that they have no legislation whatever in the United States, even upon such important subjects as the contagious diseases of animals. . . It

is hardly right to expect that a Gentleman widely acquainted with agricultural life should be Vice-President of the Council, and have charge of educational matters.

Gladstone thought that there was much to be said for the administration of the Contagious Diseases of Animals Act to be attached to the department which was proposed to be specially charged with the affairs of agriculture and commerce. Joseph Chamberlain said he considered the House might trust the Government to put into practice the principles they were now willing to accept. With this acceptance the next move was the change of the title of the Veterinary Department in 1883 to that of the Agricultural Department of the Privy Council, and the work of collecting the agricultural returns was transferred from the Board of Trade to this new Agricultural Department. As a result, detailed statistical tables relating to home and foreign animals were published on 10 March 1884. These gave firstly the number of home-bred cattle, sheep and pigs existing in the month of June in England, Wales and Scotland, for the years 1879 to 1883; secondly—for the same period—the statistics dealing with contagious or infectious diseases, pleuro-pneumonia, foot-and-mouth disease, sheep scab, glanders, farcy and swine fever; thirdly, county statistics in regard to pleuro-pneumonia and foot-and-mouth disease, and fourthly, county statistics for 1883 for glanders, farcy, sheep scab and swine fever. The next tables dealt with imported healthy cattle for the years 1879-83 and at which ports they had been received. A separate table dealt with diseased animals imported over the same period. Finally the numbers of healthy animals landed from Ireland were given, but no reference was made to any affected animals.

The next development of significance was an Order in Council in 1886 appointing a Committee of Council for Agriculture which ensured that the Lords on this Committee were only called upon to deal specifically with agricultural problems.

Two years later the report of a departmental committee charged with enquiring into pleuro-pneumonia and tuberculosis as affecting livestock in the United Kingdom, stated:

Believing, as we do, that it is only by uniformity of action that we can hope to contend successfully with pleuro-pneumonia, we desire to express our firm conviction of the desirability of vesting the administration of The Contagious Diseases (Animals) Acts, in a single governmental department, which should be sufficiently representative of the United Kingdom of Great Britain and Ireland.

The following year the Board of Agriculture was established which included the Agricultural Department of the Privy Council Office, whose title was now changed to the Veterinary Department of the Board of Agriculture, and under this Act the powers of the Privy Council under the Contagious Diseases (Animals) Acts were transferred to the Board.

THE BOARD OF AGRICULTURE ACT, 1889

On the 12 of August 1889 an Act for establishing a Board of Agriculture for Great Britain received the Royal Assent [52 & 53 Vict. c. 30]. It enacts that there shall be established a Board of Agriculture consisting of :

The Lord President of the Council,
 The Secretary of State for Home Affairs,
 The Secretary of State for Foreign Affairs,
 The Secretary of State for the Colonies,
 The Secretary of State for War,
 The Secretary of State for India,
 The First Lord of the Treasury,
 The Chancellor of the Exchequer,
 The Chancellor of the Duchy of Lancaster,
 The Secretary for Scotland,

and such other persons (if any) as Her Majesty the Queen may from time to time appoint during Her Majesty's pleasure.

The Board of Agriculture was established on the 9th of September 1889 by appointment of the President of the Board. The President must be a Privy Councillor and is appointed during Her Majesty's pleasure and may be a member of the House of Commons.

The following Departments were by the Act transferred to the Board, namely:

- (a.) The Agricultural Department of the Privy Council Office.
- (b.) The Land Commissioners for England.

The Treasury also have power to transfer to the Board the Ordnance Survey Department of the Commissioners of Works.

Power is also given to Her Majesty to transfer to the Board by Order in Council such powers and duties of any Government Department as are conferred by or in pursuance of any statute, and appear to Her Majesty to relate to agriculture or forestry, and to be of an administrative character. The draft of any such Order must be laid before each House of Parliament for thirty days whilst sitting and is not to be passed if either House objects by the presentation of an address, and no such Order shall in any respect affect the exclusive control of the Secretary of State for India over the candidates for the Indian Forest Department at Cooper's Hill College or elsewhere.

Beyond the powers and duties imposed on the two Departments transferred by the Act, the Board of Agriculture are to undertake the collection and preparation of statistics relating to agriculture and forestry, and may also undertake the inspection of, and reporting on, any schools which are not public elementary schools, and in which technical instruction, practical or scientific, is given in any matter connected with agriculture or forestry, and the aiding of any school which admits such inspection, and in the judgment of the Board is qualified to receive such aid and the aiding of any system of lectures or instruction connected with agriculture or forestry, and the inspection of and reporting on any examinations in agriculture or forestry.

The Board of Agriculture may also make or aid in making such inquiries, experiments, and research, and collect or aid in collecting such information as they may think important for the purpose of promoting agriculture or forestry.

In the Act the expression 'agriculture' includes horticulture.

The 'machinery' thus set up for dealing with all veterinary matters was to remain as the basis for the progressive development of the Veterinary Department for the next thirty years, at which time (1919) the Board was reconstituted as a Ministry. It is now necessary to return and study in a little more detail some of the events of this progress from 1881.

Towards the end of that year rumours circulated that pleuro-pneumonia had broken out in the United States. During 1882 numerous reports were received from British consuls in that country confirming the spread of this disease from Long Island to Maryland and Philadelphia and gradually extending westwards. On 31 January 1883 the Privy Council port inspector at Liverpool reported to Professor Brown that the *Kansas* from Boston had landed at Wallasey wharf 313 cattle and 398 sheep, and that 219 of these cattle had foot-and-mouth disease and six sheep had sheep scab. On 31 January the acting British Consul in the State of Maine reported that hog cholera (swine fever) had broken out. In Philadelphia, later in the same year, outbreaks of anthrax, in such a virulent form as to be described as a 'new' disease, added to the rather dismal animal health picture. With the heavy import of livestock from America these reports were worrying to the Privy Council and provoked a good deal of refutation from the USA in regard to the existence of foot-and-mouth disease and hog cholera but none about pleuro-pneumonia. In connection with this last disease a letter from the Colonial Office to the Clerk of the Privy Council (15 October 1884) stated:

With reference to your letter of the 5th and to the reply from this Department of 12th August, respecting the conveyance of cattle from the Western States of America, through Canadian territory, for shipment to this country, I am directed by the Earl of Derby to transmit to you, to be laid before the Lord President of the Council, copies of two Despatches from the Governor General of Canada on the subject.

The Governor-General (The Marquis of Lansdowne) in a letter to the Earl of Derby, giving a long and reasoned statement on the pleuro-pneumonia situation, terminated thus:

So long as this is the case, and while there exists good reason for apprehending that these States have for some time past been exposed to the possibility of contagion, the Government of the Dominion declines to pass through its territory and to export from the same ports as those used for the exportation of Canadian cattle, animals from these districts.

In his Annual Report for 1885 Professor Brown said: 'Excepting the sudden and rapid extension of swine fever in the early part of the year, there was no event . . . to which any special importance can be attached.' He made reference to a number of mis-diagnoses made in regard to foot-and-mouth disease and for which he obviously was not prepared for his Department to be blamed. He observed that in the 1878 Act

a provision that this disease should only be diagnosed by a qualified veterinary inspector 'was struck out in the Committee stage of the House of Commons in accordance with the expressed views of several distinguished agriculturists, who contended that every farmer knew the affection sufficiently well to recognise it and that no veterinary aid was required in so simple a matter'. This must have been like a red rag to a bull to a man so dedicated to the idea of the control of disease by qualified veterinary surgeons, and, if the truth were known, he was probably pleased that these mis-diagnoses had been made.

In the following year (1886) Professor Brown submitted an excellent Report from the Agricultural Department of the Privy Council Office to the Lords of the Committee of Council for Agriculture¹ on the subject of swine fever, stimulated no doubt by the heavy outbreak of this disease during the previous twelve months. The final paragraph is typical of the man and his oft-repeated convictions on the poor control of disease by local authorities owing to lack of uniformity of action.

In reference to the measures which should be adopted for the extinction of swine fever in this kingdom, it is not necessary to enter into details. On three occasions in the last twenty years, the stamping-out system was successfully applied to cattle plague. Exactly the same means would certainly succeed in ridding us of swine plague, and there is no ground for the expectation that any less severe measures of repression would be effective. It is, however, an essential condition of success, that the action taken should be uniform and general in application. But it is impossible to suggest any means of securing the necessary uniformity while the execution of the law is in the hands of local authorities who entertain different views as to the necessity for attempting to get rid of the disease by legislative measures, and are not agreed as to the proper means of effecting the object.

Reference must again be made to the Departmental Committee's Report on Pleuro-Pneumonia and Tuberculosis, which was presented to both Houses of Parliament in 1888, and to the extremely important recommendations which it made after hearing evidence from such authorities as John M'Fadyean, Victor Horsley and G. T. Brown. It should be noted that tuberculosis figures largely in the evidence given and was responsible for some of the recommendations that were accepted, although the Lords of the Committee of Council for Agriculture refused to have it placed amongst the diseases scheduled under the Contagious Diseases (Animals) Act for reasons which will be given later. It is first necessary to refer to the main recommendations in regard to pleuro-pneumonia itself. These were:

- (1) That the system of compulsory slaughter be applied not only to all diseased cattle, but also to all cattle which have been in association with them, or otherwise in any manner exposed to the infection of disease.

¹ See page 53.

- (2) Compulsory slaughter should be accompanied by supplementary measures such as restrictions on the movement and sale of cattle within, or coming from, infected districts.
- (3) Any exception to, or modification of, the system of compulsory slaughter, as provided in the Slaughter Order, 1888, should only be applicable to cattle in the dairy yards, byres and cowsheds of large towns, the owners or occupiers of which may claim in writing the privilege of exemption for their cattle from immediate slaughter on the following conditions:
 - (a) No head of cattle that has been brought into such dairy premises shall be removed therefrom, except for the purpose of immediate slaughter.
 - (b) In the event of an outbreak of pleuro-pneumonia, all the diseased cattle shall be slaughtered.
 - (c) All the remaining cattle shall be branded and regularly subjected to the thermometer test¹, and whenever a continuous increase of temperature rising above 104° is shown, they shall be slaughtered.
 - (d) No fresh cattle shall be admitted into such premises while any of the cattle thus branded remain alive.
- (4) Inoculation for the reasons already detailed, cannot be recommended as a means of eradicating pleuro-pneumonia nor as practicable under existing conditions. Although it is open to owners to inoculate their cattle it should be distinctly understood that that operation shall not give them any immunity from the regulations above suggested.
- (5) The scale of compensation for animals slaughtered compulsorily should remain as at present. In the case of dairy cows, however, compensation should be awarded upon the basis of their value for dairy purposes, and not of their value to the butcher.
- (6) We recommend that, in order to put a stop to the frequent concealment of disease, a more stringent scale of penalties be put in force:
 - (a) That, for the first offence, the penalty should not be less than one quarter of the present maximum penalty.
 - (b) For the second offence, not less than one half.
 - (c) For the third offence, not less than three quarters.
 - (d) The full penalty for any further offence.

The above to be irrespective of anything contained in the Summary Jurisdiction (Scotland) Act, 1881.

- (7) The administration of the Contagious Diseases (Animals) Acts throughout the United Kingdom, so far as they refer to compulsory slaughter and to the treatment and control of

¹ The thermometer test was described by Alexander Williams in a circular letter, dated 16 January, 1874, issued to local authorities in Great Britain, in these words:

The internal temperature of each animal within reach of the contagion (pleuro-pneumonia) to be accurately ascertained and the herd to be divided into two lots, to be effectually separated from each other.

Lot A – to consist of those animals whose internal temperature is ascertained to be above 103° Fahr. These animals to be slaughtered with the least possible delay if more positive symptoms of pleuro-pneumonia present themselves.

Lot B – to consist of the remainder of the herd. These animals to be examined with the thermometer weekly, and to be forthwith transferred to Lot A in each case, if the temperature is found to be above 103° Fahr.

- animals in herds or on premises where an outbreak of pleuro-pneumonia has occurred, or in the surrounding area, shall be subject to and under the direction of, a central authority.
- (8) In all cases of compulsory slaughter, compensation should be provided from a national fund, whether drawn from the Consolidated Fund, or from a national rate specially levied for this purpose. All other charges – such as for inspection, disinfection, etc. – should be defrayed from a local rate, as at present.
 - (9) It is highly desirable that the system of appointing veterinary inspectors by Local Authorities should be amended. Under each Local Authority there should be one responsible inspector and care should be taken to secure the services of duly qualified and experienced veterinary surgeons.
 - (10) Throughout the United Kingdom district inspectors should be appointed by the central authority, under whose direction they shall be and to whom only they shall be responsible. Whether this system be adopted for the whole country or not, it is, in our opinion, highly desirable that it should be at once put into operation in those districts which we have already indicated as specially infected with disease.
 - (11) A more rigorous and careful inspection of town dairies and cowsheds is most urgently needed. We consider that every encouragement should be given to the removal of such establishments from crowded centres of population, and we would suggest the advisability, where possible, of suitable buildings being erected by corporations, or other authorities, and let out to dairymen and cow-keepers.
 - (12) A special system of inspection, and further restrictions upon the movement of dairy cows, should be immediately established in the Dublin districts.
 - (13) Wherever practicable, Local Authorities should be called upon to erect public abattoirs as a substitute for private slaughter-houses.
 - (14) Believing, as we do, that it is only by uniformity of action that we can hope to contend successfully with pleuro-pneumonia, we desire to express our firm conviction of the desirability of vesting the administration of the Contagious Diseases (Animals) Acts in a single governmental department, which should be sufficiently representative of the United Kingdom of Great Britain and Ireland.
 - (15) In the event of its being deemed advisable to conduct an experimental enquiry into the nature of pleuro-pneumonia and its preventive treatment by inoculation, we recommend that such inquiry should only be carried out under the following stringent regulations:
 - (a) By a Board of Experts duly appointed by the Government, and on premises specially set apart and licensed for that purpose.
 - (b) No cattle entering such premises should ever be permitted to leave them except for the purpose of immediate slaughter, and under charge of an officer, who shall see that the slaughter is duly carried out.

It is not difficult to detect the influence of Professor Brown in these recommendations, convincing the Committee of the paramount need for uniformity of action through the central control of a single Government department, with its own appointed district veterinary inspectors superintending ‘duly qualified and experienced Veterinary Inspectors’ appointed by local authorities.

Moreover he was aware that the provisions of the Local Government Act (1888)

would materially affect the working of the Contagious Diseases (Animals) Acts when they were implemented in April 1889. Under this Act, broadly speaking, many of the functions of the smaller authorities who normally dealt with diseases of animals were to be transferred to the county councils, and by this means alone the number of local authorities under the animal diseases Acts would be reduced by about 120. By this time, also, he must have realised the probability, even if he did not already know it as a fact, that a Board of Agriculture would become the central authority controlling the veterinary service the following year, with even more power than the Committee of Council for Agriculture wielded.

In the meantime, in accordance with the suggestion of the Departmental Committee, an Order was prepared to include tuberculosis on the list of contagious diseases under the Act, which would empower authority to slaughter animals so affected when found on an owner's premises and to pay compensation; to seize and slaughter compulsorily such animals if exposed at fairs and markets or during transit; and to take similar action against tuberculous foreign cattle and those exposed in the same cargo. Professor Brown, however, foresaw difficulties ahead and, before the Order was passed, deemed it prudent to submit to their Lordships of the Committee of Council for Agriculture certain points. These were, that tuberculosis was very often difficult to detect; that other diseases, such as actinomycosis and lymphadenoma, could be mistaken for it; and that chronic tuberculous mastitis could, at times, only be diagnosed by microscopical examination of the milk—and it was generally agreed that this form of tuberculosis was by far the most dangerous to human beings.

Brown submitted that compensation would certainly form a bone of contention between owners and local authorities, because 'piners' and 'wasters' if valued under the 1878 Act would obtain a proportion of the value of the cow immediately before it became ill, that is, when it appeared healthy. A waster was worth its hide only, but before it became clinically affected with tuberculosis it might have been very valuable. Their Lordships were impressed by this reasoning and did not therefore deem it expedient to pass this Order in Council. They did pass the Pleuro-Pneumonia Slaughter Order of 1888, making it compulsory on every local authority in Great Britain to slaughter all affected cattle and all cattle that had been either directly or indirectly in contact with the disease. They also passed, later in the year, a second Order, the Pleuro-Pneumonia (Infected Circles) Order 1888, which ensured that immediately an inspector declared the existence of pleuro-pneumonia in a shed or place the Act of 1878 made that shed or place 'an infected place', and the Pleuro-Pneumonia (Infected Circles) Order made the whole space lying within a distance of half a mile from any part of such infected place into an infected circle without any further action on the inspector's part, and thereupon it became illegal to move cattle either in or out of the circle, except by licence of the local authority.

Ultimately, on 1 September 1890 the Pleuro-Pneumonia Act of that year came into operation, revoking the provisions of the Act of 1878 relating to the slaughter of diseased and contact cattle by local authorities, and substituting other provisions under which slaughter on account of pleuro-pneumonia was to be carried into effect by the Board of Agriculture. The cost of the execution of the Act, including compensation, was to be defrayed out of imperial funds instead of out of the local rates. In other respects the power of local authorities to deal with pleuro-pneumonia and other diseases was left undisturbed. As has already been seen, local authorities however thoroughly they applied the regulations within their own boundaries were powerless beyond them, and cattle, which were known to have been exposed to infection, when moved out of the area were safe from any interference from the authority who was charged with the work of stamping out the disease. Under the new Act the action of the Veterinary Department of the Board was in no way limited by boundaries of districts. Once the disease had been definitely diagnosed, and confirmed by examination of lungs at the Royal Veterinary College, a travelling inspector from the Department took over the premises and arranged in collaboration with the veterinary surgeon for the slaughter of the diseased cattle first, and then those that had been in direct or indirect contact. For the first time the Department became charged with the direct administration of an Act of Parliament instead of being called upon to supervise its administration by local authorities. In this work the inspector naturally kept in touch with the local authority from the time of his arrival. The sale of carcasses of the contact cattle was arranged by the travelling inspector, it being an instruction from the Board that no carcass should be sent to market unless the veterinary inspector had satisfied himself as to its fitness for human food.

In addition to the slaughter of all these animals severe restrictions were imposed over large areas on the movement of cattle, and a number of veterinary surgeons were instructed to visit fairs, markets and slaughterhouses, and to render weekly reports. The Board also, for the purposes of the Act, might employ such additional inspectors, valuers and other persons and at such remuneration and expense as deemed necessary, subject, of course, to the sanction of the Treasury. For this purpose an account was opened at the Bank of England—the Cattle Pleuro-Pneumonia Account of Great Britain—for the sum of £140,000 per annum provided by Parliament, towards defraying these expenditures. If this sum in any one year was insufficient, the Local Government Board and the Secretary for Scotland were required, out of the Local Taxation Account (and the Local Taxation [Scotland] Account), to pay the Cattle Pleuro-Pneumonia Account such additional sums as might be certified by the Board of Agriculture. If, however, there was a surplus at the end of the year, there could be repayment to the Local Taxation Accounts in proportions laid down in the Act. The 1890 Act also applied to Ireland where the Lord Lieutenant and the Privy Council acted instead of the Board of Agriculture.

In 1890 a departmental committee of the Board of Agriculture and the Board of Trade was appointed by the President of the former Board to inquire into and report on the transatlantic cattle trade. This had been necessitated by the large numbers of casualties occasioned in this traffic, and about which there were some unpleasant rumours of unnecessary suffering during the sea voyage. The Committee recommended in 1891 that the Board of Agriculture should make regulations prescribing where cattle should be carried in a ship; how much space should be allotted for each animal; the size and construction of the fittings, the pens and the width of passageways; the provision of adequate ventilation, lighting and fresh water, with particular regard for the proper means of its distribution amongst the cattle, and all matters 'generally for protecting the animals from unnecessary suffering during the passage by sea'. To this end, powers of inquiry, similar to those possessed by the Board of Trade under the provisions of the Merchant Shipping Acts, should be conferred on the Board of Agriculture with regard to casualties and losses among cattle during their transit by sea.

The Committee also recommended that in every case the foreman should not have less than four competent assistants for the care of each hundred head of cattle and that these men should sign ships-articles and be directly under the authority of the Captain, 'who shall have power to prevent any inhumanity to animals while on board ship'. Insurance companies should take every care to remove the impression, which certainly existed among cattle-men, that insurance agents desired them to keep suffering cattle alive and that the policy would not be paid if such animals were slaughtered on board.

The discovery of the tubercle bacillus by Professor Koch in 1882 and the findings of the Departmental Committee on Pleuro-Pneumonia and Tuberculosis in 1888 were to stimulate the setting up of several Royal Commissions as well as an International Congress (1899) within a few years. Professor Brown himself seemed rather pessimistic on the subject.

It is admitted [he said] that there is no reasonable probability that the disease will ever be extirpated, and there is besides the significant fact that all the applications which have been made to the Veterinary Department to include tuberculosis among those diseases which are dealt with by legislative measures have been based on the presumption that the use of meat from tuberculous animals is prejudicial to public health. Recently the subject had been brought to the notice of stock owners and dealers in a very pronounced way in consequence of the frequent seizure by sanitary authorities of carcasses of cattle which, after being sold in open market as healthy cattle in fine condition, had been found affected on post-mortem examination, and had been confiscated without any compensation to the purchaser, who had acted throughout in good faith, as also had the seller and all other persons concerned in the transaction.

Professor Brown said that he was not at all surprised that the sufferers should appeal

to the Board of Agriculture. In April 1889 a deputation of butchers and cattle traders had, in fact, waited on the Presidents of the Local Government Board and the Board of Agriculture and had pressed their case on two scores; first that they were powerless, in the circumstances, to protect themselves against losses, which were unavoidable if the public were to be protected, and therefore they had a fair claim for compensation; and secondly, that there was no justification for the seizure and destruction of meat which appeared perfectly healthy to the eye of the meat inspector and presented all the appearance of meat of good quality, merely because some of the internal organs were affected with tubercle. These complaints led eventually in 1890 to the first of the Royal Commissions on Tuberculosis to enquire into the 'Effect of Food derived from Tuberculous Animals on Human Health'; whilst the next Commission, which reported in 1898, investigated the 'Administrative Procedures for controlling Danger to Man through the use of Meat and Milk of Tuberculous Animals'. Professor M'Fadyean, Principal of the Royal Veterinary College and Professor of Comparative Pathology and Bacteriology, described to the Commissioners the early difficulties he had encountered in the development of tuberculin and the explanation of why he had at first found the tests untrustworthy. To the second Commission he stated that '... using tuberculin on animals in their own premises, I have found that it is practically infallible'. M'Fadyean told the members that in his opinion there was no danger from milk from a tuberculous cow 'unless it comes from a diseased udder' and 'such cows should be slaughtered'. He thought that the 'steaming of milk was the best of all precautions'—and, typically, he added 'it is inexpensive and absolutely certain'. He did not think that tuberculosis was conveyed frequently to human beings by the ingestion of flesh from tuberculous animals; nor did he approve of the total destruction of a carcase when the disease was localised. He recommended the system used in France, by which a carcase was only condemned if the lesions were generalised or if tubercle had invaded the greater part of an organ or was manifested as a tuberculous pleurisy or peritonitis. The system of total seizure would lead, he said, to the destruction of 15 to 20 per cent of all adult cattle in this country and probably to 30 per cent of our dairy cows, whilst the French system would not lead to destruction of more than one in 200.

The Commissioners accepted his conclusions about tuberculin and recommended that funds be placed at the disposal of the Board of Agriculture in England and Scotland, and the Veterinary Department of the Privy Council for Ireland, for the preparation of commercial tuberculin, and that stock-owners should be encouraged to have their animals tested by the offer of free tuberculin tests on condition that they should be carried out by a veterinary surgeon, that the owners would isolate reactors, and that the tested stock would be kept under satisfactory sanitary conditions.

It is a remarkable fact that in subsequent years Sir John M'Fadyean did not have

to retract any of the evidence which he gave before these early commissions. He did not live to see the triumph of attestation throughout the whole country, but his joy at the result would certainly have been unbounded.

The Pleuro-Pneumonia Act came into operation in September 1890, and the Veterinary Department seemed to be rather surprised at the quickness of the success of the stamping-out scheme, for by the end of that year the monthly total of outbreaks had fallen below twenty, and it continued to fall till the following summer. Then two large outbreaks developed, one in Hampshire and the other in Cumberland, and these led to thirty-five secondary outbreaks in July. After that, however, there was a steady fall in the incidence, with thirty-five outbreaks recorded for the year 1892 and only nine for the whole of 1893.

In 1894 Professor Brown said:

It is not possible to assert that bovine pleuro-pneumonia has been entirely extinguished. Even in a small island like Great Britain it is not very difficult, for those who desire it, to keep the disease concealed, by sending cattle to be slaughtered immediately on any sign of illness appearing, and disposing of the rest of the stock at the most convenient markets. It may therefore be expected that outbreaks of the disease may be discovered from time to time, but there need be no apprehension of any extensive spreading of the affection with the present machinery for the purpose of detecting and arresting it.

In the event he was proved right. A few isolated pockets of infection did flare up but were immediately suppressed and the country was finally declared free of the disease in 1898.

The pleasant surprise of the early successes of the fight against pleuro-pneumonia was marred by an unexpected outbreak of foot-and-mouth disease at Islington in February 1892. The disease was discovered among cattle which had just been imported from Denmark, a country which at the time was considered free from this infection. The fact that the County of London was under restrictions on account of the pleuro-pneumonia campaign fortunately enabled the travelling inspectors to trace all the cattle which, of course, had been moved from the market under licence. Despite this, the outbreak spread to several districts and even reached Scotland. However, the Veterinary Department machinery was now working effectively and by midsummer the country was cleared. The power of slaughter of foot-and-mouth disease cases which was conferred on the Board of Agriculture in 1892 had enabled vigorous action to be taken to stamp out the disease by the immediate slaughter of affected and contact animals, and by the continued restriction of movement on a uniform plan throughout the country. Trade in live animals from any infected countries was also finally prohibited in this same year. These measures proved particularly successful in keeping down the incidence of foot-and-mouth disease in this country for the next twenty-five years, during which period there were only 235 outbreaks. The Contagious

Diseases (Animals) Act of 1892 came into operation on 27 June of that year giving powers to the Board of Agriculture to pay the expenses of the foot-and-mouth outbreak from the Cattle Pleuro-Pneumonia Account.

During that year the number of cases of rabies in the country had fallen to such an extent that the Board of Agriculture passed new Orders on 1 November 1892 revoking all former Orders which had provided for the muzzling of dogs in the City of London and the Metropolitan Police Districts, as well as in eight counties and the West Riding of Yorkshire. The new Orders empowered local authorities to revert to the original system of making their own local regulations as to muzzling. At the same time they imposed on them the specific duty of seizing and disposing of all stray dogs found within their districts. The muzzling Orders, generally speaking, had been unpopular and cynics were not slow in suggesting that withdrawal of this irksome piece of legislation at the time of a general election was a political manoeuvre. Be this as it may, there occurred during the next three years, as the result of the withdrawal of the muzzling Orders, a significant increase in the number of reported cases of rabies throughout the country; the same trend was also very evident in the County of London; and, sadder still, the number of deaths from hydrophobia in England and Wales for the same period showed similar features. The Chief Veterinary Officer, A. C. Cope, giving evidence in 1897 before a departmental committee on 'Laws relating to Dogs', convinced the members 'that muzzling is not only an efficient, but the only means which is now practical, for the extermination of rabies, and that the powers of muzzling as exercised since 1892 by local authorities, acting in complete independence of one another, are inadequate to eradicate rabies, and only result in temporary and local checks to its spread'. Major J. T. Tennant, Principal of the Animals Division, said 'the futility of the system which has been in operation since 1892 largely accounts, in our opinion, for its unpopularity. It produces the maximum of local irritation with the minimum of general and permanent good.' After hearing more, and very cogent evidence, the Committee reported:

The Board of Agriculture, under the law as it stands, have the power and the machinery necessary to enforce muzzling in a general and systematic way, and experience has shown that by the exercise of the functions vested in them as a central authority, the suppression of cattle plague, foot-and-mouth disease, and pleuro-pneumonia, has been obtained. We think, therefore, that the time has come and that the circumstances are opportune for the Board of Agriculture to make a determined and systematic attempt to stamp out rabies. This will not, in our opinion, involve universal muzzling, inasmuch as there are districts where rabies has never appeared. What is necessary is that the Board should have regard to the country as a whole and should impose muzzling over considerable areas, irrespective of the boundaries of boroughs and counties; that the Board should impose it, in fact, where it is really required and leave the rest of the country free. We believe that much of the feeling against the present capricious and ineffective system of partial and uncertain muzzling will not show itself against the operation of a

centralised system carried out on well-considered lines and effectively producing the result which all desire to see achieved, viz. the suppression of rabies. We confidently hope that our proposal will achieve this result and that it will then become unnecessary again to resort to a measure, the inconvenience of which we fully recognise, but which we now recommend as the only practical means to a much desired end.

Basically, these recommendations about muzzling were responsible for the elimination of rabies from Great Britain, for the first time, in 1902. Much credit has been given to Walter Long for the enforcement of the Orders throughout the country in the face of great popular opposition¹.

Professor Brown in his Report for the year 1890 contended that swine fever was next in importance to bovine pleuro-pneumonia and that it had remained comparatively unaffected by the sanitary laws which had been in force for twelve years. He had for a long time insisted that it could only be successfully dealt with by a ruthless 'stamping-out' system, accompanied by a general restriction on movement of pigs, and the prohibition of public sales of these animals in infected areas. Such a system as this could only be satisfactorily enforced by a central authority and the Board did not possess sufficient powers to undertake the necessary action for getting rid of the disease. To overcome this a departmental committee was set up in 1893 to inquire into the subject of swine fever, more especially with reference to the necessity of further measures for its extinction. The Committee recommended that the task of stamping out swine fever should be carried out by the Board of Agriculture and this recommendation was acted upon immediately. A Bill was introduced into Parliament to confer the necessary powers, and these were contained in the Contagious Diseases (Animals) Act 1893 which thus gave the Board the authority to slaughter and pay compensation when, in its opinion, such action was required for stamping out the disease. An explanatory circular was sent with the Swine Fever Order of 1893 to all local authorities, and the Board appointed a number of additional inspectors to help deal with the disease. Briefly, on receiving notice that swine fever was suspected a veterinary surgeon was requested to visit the premises. If he considered that there were grounds for thinking that it was swine fever he could value and then slaughter an affected pig and carry out an immediate post-mortem examination. Specimens of affected bowel and glands were despatched to the London offices for examination by the veterinary inspectors there. If the diagnosis was confirmed a travelling inspector then took over and arranged for all the pigs to be slaughtered. In the last two months of 1893 the Board dealt with 536 outbreaks in which 1,147 pigs had died from the disease and over six thousand other pigs, either sick or in-contact, were slaughtered.

¹ Walter Long became President of the Board of Agriculture and a Privy Councillor in 1895 after the fall of the Earl of Rosebery's Government. It is of interest to record that he, like Henry Chaplin, the first President of the Board of Agriculture, was made a Member of the Cabinet. Both Gladstone and Lord Rosebery omitted Herbert Gardner from the Cabinet when he was President of the Board of Agriculture.

By analogy with cattle plague it seemed a fair assumption that if the same techniques and restrictions on movement were employed ruthlessly it would only be a matter of time before swine fever was eliminated from the country. The Board was fortified in this hope by the fact that piggeries emptied as a result of the disease could, after disinfection, be safely restocked within weeks without recurrence of the infection. It was realised from the first that the disease was widespread throughout the country and that it would therefore require patience and perseverance to effect its clearance. But, contrary to expectation, this result was not achieved. It is a complicated story dealt with elsewhere in this book.

It was during W. E. Gladstone's administration in 1894, with Herbert Gardner as President of the Board of Agriculture, that the most important Act to date in regard to animal diseases was passed—the Diseases of Animals Act 1894. The Bill, after amendment by a Joint Committee of Lords and Commons, consolidated¹ the Contagious Diseases (Animals) Acts of 1878 to 1893. The Board of Agriculture Act of 1889 had transferred to the Board the powers and duties of the Privy Council under the Acts of 1878–86. In the fifth Schedule of the 1894 Act the following enactments were repealed.

<i>Title or Short Title</i>	<i>Extent of Repeal</i>
The Contagious Diseases (Animals) Act, 1878	The whole Act except Section 34 dealing with ports and foreign animal imports.
The Contagious Diseases (Animals) Act, 1884	The whole Act.
The Contagious Diseases (Animals) Transfer of Parts of Districts Act, 1884	The whole Act.
The Contagious Diseases (Animals) Act, 1886	The whole Act, except Section 9, dealing with transfer to Local Govt. Board of Powers of Privy Council under Sect. 34, as to regulation of dairies, etc.
Board of Agriculture Act, 1889	Section 3 (this section allowed transfer of certain powers and duties of any Govt. department that appear to relate to Agriculture, and to be of an administrative character).
The Contagious Diseases (Animals) (Pleuro-pneumonia) Act, 1890	The whole Act.

¹ A Consolidation Act is an Act which repeals a number of earlier Acts and then collectively re-enacts them in so far as they are still operative. Such an Act does not normally contain new provisions but it brings the existing law on a particular subject within the compass of one statute.

<i>Title or Short Title</i>	<i>Extent of Repeal</i>
The Contagious Diseases (Animals) Acts, 1892	The whole Act.
The Contagious Diseases (Animals) Acts, 1893	The whole Act.

The Act of 1894 embraced all the legislation in the Contagious Diseases (Animals) Acts, combined with the powers obtained under the 1889 Board of Agriculture Act, and thus the Board obtained very wide discretionary powers in the handling of any disease affecting animals. Sir Francis Floud, writing more than thirty years later in this connection, said:

with regard to the control measures enforced in this country, the Act of 1894 confers a very wide discretion upon the Ministry of Agriculture, which is empowered to make any Orders that it considers necessary to prevent the spread of disease. The powers of the Ministry afford a striking example of subordinate legislation, having the force of an Act of Parliament, but imposed or removed at the sole discretion of the Minister. Whatever opinions may be held as to the constitutional propriety of subordinate legislation in general, it will probably be agreed that it could not be avoided in dealing with diseases, when instant action to meet the particular circumstances of each outbreak is essential.

The Diseases of Animals Act 1894, whilst indicating the general lines of the procedure to be adopted, empowered the President of the Board of Agriculture to prescribe the details by administrative Orders. The Board was designated as the central authority for Great Britain, and the county councils and the councils of all boroughs which had a population of 10,000 or more at the Census of 1881 were appointed as the local authorities. The latter were required to execute and enforce the 1894 Act and any subsequent orders of the Board through the police and to appoint veterinary and other inspectors for the purpose¹. Some idea as to the breadth of the powers under the Act may be gained by referring to a few of the Sections. For example:

19. The Board of Agriculture may make such orders as they think fit subject and according to the provisions of this Act for directing or authorising, in case of the existence or suspected existence of any disease other than cattle plague and under such conditions as the Board think fit to prescribe, the slaughter of animals by local authorities, either generally or in particular instances, and in all or any of such cases the payment of compensation for the same by local authorities out of the local rate; and the Board may by such Orders direct or authorise the slaughter both of animals actually infected with disease, and also of animals suspected of disease, or being or having been in the same field, shed, or other place, or in the same herd or flock, or otherwise in contact, with animals affected with disease, or being or having been otherwise exposed to the infection thereof.

¹ Under the Agriculture Act of 1937 the whole-time veterinary inspectors of the local authorities were transferred to the central department in April 1938 to form the Animal Health Division of the Ministry of Agriculture and Fisheries.

In regard to compensation, the Act empowered the Board to use the Cattle Pleuro-Pneumonia Account of Great Britain also for foot-and-mouth disease and swine fever. In the latter disease, however, not more than £50,000 could be used annually for compensation, costs and expenses. In all other cases payments would be made by local authorities out of local rates.

49.

- (i) The Board of Agriculture may alter or revoke any order of the Board.
- (ii) Every order of the Board shall have effect as if it had been enacted by this Act.

Control of a different nature was introduced under Section 35 (3) which read:

The Board, on being satisfied on inquiry that an inspector of a local authority is incompetent, or has been guilty of misconduct or neglect may, if they think fit, direct his removal, and thereupon he shall cease to be an inspector; [and, in 44 (i)] Any inspector shall have, for the purposes of this Act, all the powers which a constable has, under this Act or otherwise, in the place where the inspector is acting.

The general soundness of this comprehensive Act is evidenced by the fact that it virtually remained unchanged for over fifty years¹.

Two other notifiable diseases, sheep scab and glanders, were endemic in Great Britain long before the Veterinary Department started and for this reason it is interesting to refer to their historical setting.

It was mentioned that as far back as 1798, in George III's reign, an Act had been passed to prevent 'the depasturing of Forests, Commons and other open fields with sheep or lambs infected with Scab or Mange in that part of Britain called England'. For this reason when, many years later, legislation against other diseases of animals was made, sheep scab was automatically included, although perhaps it would have been better described as a contagious disease and not one requiring the stamping-out approach, since it was well known that scabies could be checked and cured by various skin dressings or baths. Despite the fact that the disease had been the subject of legislation for the best part of a century, the Veterinary Department Report for 1894 stated:

during the past year sheep scab was more widely spread in Great Britain than in any of the five preceding years. In fact it is doubtful if any good has been done by the regulations of local authorities in various parts of the country. The fact of the continued prevalence of a disease which could be so easily checked is in itself evidence of the indifference of flock masters to its ravages.

Subsequent experience showed this to be a somewhat harsh judgment on many flock masters who went to considerable trouble in dipping their sheep. Nevertheless, despite every effort, sheep scab was not finally eliminated from this country until 1952.

¹ The 1894 Act and subsequent Acts were consolidated by the Diseases of Animals Act 1950.

Scabies brought about its ill-effects by the constant irritation of acari, leading to loss of bodily condition and ruination of the wool, and thereby was of considerable economic importance. Glanders, by contrast, was a killing disease of horses, donkeys and mules, transmissible to man. It will be recalled that the Remembrancer of the City of London had reported to the Privy Council that the Court of Aldermen had appointed a veterinary surgeon as inspector at Smithfield market in January 1845, and that as a result 'many horses affected with Glanders have in consequence been seized and destroyed'. In 1853, in a continuation Act of one of the 1848 Acts, it was made an offence to expose for sale a horse known to be affected with glanders, offenders being liable on conviction to pay 'any sum not exceeding twenty pounds'. Glanders was scheduled in the 1869 Act and was made notifiable by the Contagious Diseases (Animals) Order of that year and, by an Order in Council in 1873, farcy was included under the same Act. Various Orders were passed from time to time but, as Professor Brown continually pointed out, they were easy to evade. Then, in 1892, the Board of Agriculture issued the Glanders or Farcy Order by which local authorities were given permissive power to cause to be slaughtered any diseased horse, ass or mule, and any such animal that had been exposed to the infection, and to pay as compensation half the value of the animal if diseased, with a £20 limit, and, if not diseased, the full value. If the owner objected to slaughter, the local authority could not proceed without the special sanction of the Board of Agriculture.

In 1894 a new Glanders or Farcy Order was passed which revoked the 1892 Order. The local authority was now empowered to slaughter any horse, ass or mule suspected of being infected, but again only with the consent of the owner. Compensation for an affected animal was to be what the local authority deemed expedient, with a minimum of £2 for a horse and 10s. for an ass or mule, but in no case was the compensation to exceed a quarter of the value of the animal immediately before it became diseased.

The number of cases of glanders reported by the Veterinary Department from 1870 onwards showed a definite and fairly steady increase up to 1892 in which year over 3,000 cases were returned by the Board of Agriculture. For the next six years there was a slow but steady fall, attributed to the provisions of the two Glanders or Farcy Orders and in 1898, 1,385 cases were confirmed. At this juncture Walter Long, as President of the Board of Agriculture, ordered an inquiry to ascertain whether any more effective measures could, with advantage, be taken to prevent the spread of this disease. Evidence was given by members of various county councils and corporations, and professional opinions expressed by Professors J. M'Fadyean (London), and J. McCall (Glasgow); and by J. W. Axe (Chief Veterinary Inspector, Surrey County Council), and William Hunting (London County Council). Once again the Committee emphasised that too much stress could not be laid on 'the need of obtaining uniformity of action by the various local authorities . . . by a more extended system of supervision by the central

authority'. The Committee recommended that Article 3 of the Glanders or Farcy Order 1894 should be amended to permit immediate notification of disease either to a veterinary inspector of the local authority or to a constable, and that legislation should be introduced making it obligatory on every veterinary surgeon in Great Britain to notify, to such person as the Board of Agriculture should direct, all cases of glanders or suspected glanders of which he became aware.

The Committee was convinced by the veterinary evidence that mallein was a very sensitive diagnostic agent, but after due consideration came to the conclusion that the use of mallein should not be made directly compulsory. The Committee was quite definite that it should be made obligatory for all local authorities to slaughter every horse, ass or mule within their districts which showed clinical symptoms of glanders, with compensation on a prescribed scale payable by the local authority.

The final recommendation was that the Board of Agriculture should conduct experiments with regard to the use and efficacy of mallein. The report was signed by Lord Stanley and his Committee on 2 June 1899. In view of the opinion accepted by the Committee 'that there can be no prospect of entirely and finally extinguishing glanders in this country, owing to the practical impossibility of preventing its re-introduction from abroad', the above date becomes significant because the Boer War broke out on 11 October 1899. In the *Veterinary History of the War in South Africa (1899-1902)* Sir Frederick Smith made a scathing attack on the Remount Department of the War Office for the indiscriminate way that it collected together remounts and war-weary or sick horses. He said: 'Glanders and Mange are the earliest diseases to appear in the Field, and it ought not to have been necessary to point this out in the twentieth Century.' Yet the Remount Department appeared to ignore all veterinary advice in these matters, with appalling results. Glanders became rampant. Mallein was not procurable in sufficient amounts, and in practice it was found that only mallein prepared at the Royal Veterinary College under Professor M'Fadyean gave reliable reactions; other malleins proved worse than useless because they misled those who were trying to control the disease.

During the chaos caused by these equine maladies, a disease new to South Africa began insidiously to appear in various Army units. In November 1900 Colonel Blenkinsop found at Johannesburg two mules and a horse 'showing symptoms of glanders, but I am also suspicious of ulcerative lymphangitis'. Unfortunately all three animals reacted to mallein and were immediately destroyed. Six months later a civil veterinary surgeon working at the remount depot in Cape Colony said categorically that quite a number of so-called 'farcy' cases were not glanders as they gave no reaction whatsoever to mallein. Again, rather unfortunately, much of the mallein had been proving unreliable and these animals were likewise destroyed. During 1901 and 1902 similar cases became more numerous. After the cessation of hostilities, some of these horses with farcy-like lesions

were investigated by Arnold Theiler who soon showed that the causal agent was the cryptococcus of Rivolta, the organism responsible for epizootic lymphangitis, which was recognised as being responsible for this disease in certain other parts of the world from which remounts had been purchased.

At the end of hostilities many thousands of the Army horses, mules and donkeys had been sold to the Commission dealing with the rehabilitation of the devastated areas, and it is little wonder that both glanders and epizootic lymphangitis were spread widely. During the occupation period 1903-04 there were 455 confirmed cases of lymphangitis. As this disease was increasing glanders was decreasing and being brought under control by the use of an efficient mallein.

In August 1902 many of the horses not required in South Africa were sent back to Great Britain with their units. The first indication of trouble ahead was the discovery by M'Fadyean, in December 1903, of a case of epizootic lymphangitis in the horse clinic of the Royal Veterinary College.¹ Investigation proved that this horse had been 'cast' from the Army and bore the South Africa brand. Five months later (May 1904) other cases appeared in privately owned stables and in every case they were shown to have been cast from the Army. The Board of Agriculture thereupon made the Epizootic Lymphangitis Order of 1904 which ensured that all suspected horses were isolated and prevented from moving throughout the country. Rumours of spread of this new disease, however, continued to circulate and in July 1904 a question was asked in Parliament. The Secretary of State for War told the House that the total number of army horses affected so far in this country was 394. These cases had been spread over thirty military stations, of which Woolwich had been by far the worst affected and in whose lines 351 horses had been diagnosed as infected. To try and prevent spread of the disease any further the sale of cast horses from affected units was prohibited for a period of six months after the occurrence of the last proven case in their lines. In April 1905, ninety-six fresh cases were reported, but one month later the Secretary of State for War informed the House that the Army had practically stamped-out the disease. There must have been some drastic action during that intervening month! Sir Frederick Smith said that the introduction of this new terror to horse-owners had been entirely due to the Remount Department neglecting to listen to veterinary advice. He blamed that Department for approving the suggestion that these horses should be sent back in such numbers to this country. 'It was the culminating blot on an administration which from first to last blundered through ignorance . . . particularly in all veterinary matters with which it interfered.'

Officially, epizootic lymphangitis was said to have been finally eliminated from this country by 1906. The Board of Agriculture by the Order in 1904 had made

¹ Several cases had occurred at the Curragh, however, in 1902 and 1903, and had been traced to South Africa.

it difficult for the disease to be spread and army guns appear to have done the rest.

By 1900, the Veterinary Department of the Board of Agriculture was functioning smoothly, backed by powerful and comprehensive legislation, the Diseases of Animals Act of 1894. The more important steps by which this change had been brought about have been traced already. But, it might still be asked, who really was the architect of this rapid progress in veterinary state medicine? There were quite a number of eminent men with agricultural interests both in the Privy Council and on the Council of the RASE, such men as W. E. Forster, Sir George Grey and the Duke of Richmond, who at all times showed the keenest interest. In the veterinary field the names of Beart Simonds, John Gamgee, George Brown, James McCall, William Hunting and John M'Fadyean must live on in the history of this period. Professor Simonds, who had been adviser to both Councils at the time of the outbreak of cattle plague, was not really scientifically eminent nor did he appear to be a good administrator; by happy chance, however, his chief inspector, George Brown, was different. Brown had previously been appointed Professor of Veterinary Science at the Royal Agricultural College, Cirencester, in 1851 and his experience there in dealing with farm livestock and in administering his department had given him just the right background to study the field problems associated with the cattle plague outbreak. When, in 1872, Professor Simonds retired it was evident that Brown had formulated in his own mind some very definite ideas as to how veterinary state medicine should be developed and administered, and W. E. Forster was one of the first to appreciate his abilities in this respect. Brown, whether giving evidence before, or acting on, a commission or committee, or when compiling his annual reports, or when writing in the *Journal* of the RASE or in *The Field*, took every opportunity to advocate more central control for dealing with animal diseases. Veterinarians were, in his opinion, the only people qualified to judge veterinary matters, and the successful development of the Department depended to some considerable extent on the careful placing of good people in key positions; but woe betide those officers who failed in their duty. It will be recalled that in the 1894 Act the Board of Agriculture acquired the power to dismiss a veterinary inspector of the local authority for any dereliction of duty, and who but George Brown could, at that time, have got such a clause included in that legislation?

George Brown officially retired by age on 30 December 1893 but he was retained in a consultative capacity during the first three years of A. C. Cope's appointment as Chief Veterinary Officer to the Board of Agriculture. When Brown died in June 1906 his obituary notice contained these words:

He was a veterinary expert and administrator. He initiated action and legislation, and he successfully guided measures against disease with a precision and effect which has not since been

equalled. . . . It is difficult to trace the whole of the beneficial influence of the late Sir George Brown in his profession, but it was certainly wide and deep – perhaps unequalled by anyone since the Charter of 1844 was obtained.

A. C. Cope was a good administrator as one would expect of a man who had served for so many years under the influence of Sir George Brown. His official advice whether dealing with glanders, bovine tuberculosis, sheep scab or any other of the common maladies of farm stock was essentially sound but, understandably, empirical. The Tuberculosis (Animals) Compensation Act 1903, for example, dealt with the situation created by the demand for compensation by butchers, whose apparently healthy purchases from farmers were condemned in the slaughterhouse for tuberculosis. Cope's advice went to the heart of the matter in ensuring that compensation under the Act was payable provided the Magistrate ordering the destruction of the carcase was satisfied that the animal had had a good appearance before slaughter, was well nourished and exhibited no visible signs of tuberculosis that could have reasonably raised the suspicions of the purchaser.

In like manner he advised the Board in 1903 to tighten the regulations controlling sheep scab by enforcement of annual dipping of sheep by Order made under the 1894 Act. Although a few years later dipping on two occasions at specified intervals was recommended as essential, powers to enforce this suggestion were not enacted for many years, and another half-century was to pass before this parasitic disease was eliminated from Great Britain.

When Cope retired in December 1904 a period of sound, but not very exciting, veterinary administration came to an end. His successor as Chief Veterinary Officer, Stewart Stockman, was an altogether different man. Young for the post, he had wide professional experience, particularly on the scientific side, and he was destined to bring about great changes in the Veterinary Department during his term of office. Stockman graduated from the Dick Veterinary College in 1890. He then studied at Alfort under Nocard, returning later to Edinburgh, first as Demonstrator and then as Professor in Pathology. He resigned his Chair in 1900 to serve in the Boer War. At the end of hostilities he entered the Indian Civil Veterinary Department and for a short period did good work in rinderpest control, but he soon returned to South Africa as Principal Veterinary Officer in the Transvaal. Here he collaborated with Arnold Theiler, who was at that time Veterinary Research Officer to the Transvaal, and his experiences here in eliminating cattle plague, glanders and epizootic lymphangitis were invaluable to him.

The appointment in 1905 of Stewart Stockman as Chief Veterinary Officer in Great Britain was a brilliant move on the Government's part, because at that time hardly any veterinary research was being carried out in this country. Almost within weeks the President of the Board of Agriculture had appointed 'a Committee to inquire into

the pathology and etiology of Epizootic Abortion and to consider whether any, and if so what, preventive and remedial measures may with advantage be adopted with respect to that disease.' M'Fadyean was appointed chairman and so began a partnership of research between these two Scotsmen that was to have far-reaching beneficial consequences in the development of veterinary medicine in this country. Working jointly at both Alpertown and at the Royal Veterinary College, by May 1909 their work was sufficiently advanced for them to ask that their original remit might be extended 'so as to include an inquiry as to the administrative measures which in view of the results of the investigation made by the Committee, should now be taken to deal with cases of the disease and to prevent the spread of infection'. As a result the original committee was enlarged and in due time recommended that, as a preliminary measure, epizootic abortion in cattle should be dealt with under an Order of the Board of Agriculture requiring compulsory notification of suspected cases of the disease, veterinary enquiry to establish the existence of the disease on any particular premises, and temporary isolation and restrictions on the movement of any cow that had recently aborted. The Committee also considered that such measures as might be thought necessary should be taken to avert the possible introduction of infection in cows imported from Ireland, the Channel Islands or the Isle of Man. Here, then, was a new approach to the veterinary problems of the Board. Research was to be stimulated in such a way that administrative procedures and legislation were to be based as far as possible on factual knowledge of the pathology and epidemiology of the disease in question rather than on the empirical procedures that had, perforce, tended to dominate the veterinary scene.

Epizootic abortion was but one of the challenges that Stockman faced when he took office. Another, and a rather obvious one in view of his friendship with M'Fadyean, whose son-in-law he became in 1908, was tuberculosis. After the discovery of the tubercle bacillus by Koch two Royal Commissions, as already noted, had been appointed and had reported. A third Commission appointed 'to inquire into the relations of Human and Animal Tuberculosis' made interim reports in 1904, 1907 and 1909. As a consequence the Board of Agriculture drew up the Tuberculosis Order of 1909 which was designed to come into operation on 1 January 1910. A copy of this Order was sent to each local authority in May 1909 accompanied by a circular letter. As this letter sets out the main points of the problem which the Order was intended to meet it is here reproduced in full, although at the same time it is necessary to point out that the 1909 Order was actually withdrawn before it became operative.

Tuberculosis

Sir,

1. I am directed by the Board of Agriculture and Fisheries to send to you for submission to your Local Authority, the enclosed copy of the Tuberculosis Order of 1909, which will come into operation on the 1st January, 1910.

2. As your Local Authority are doubtless aware, the subject of tuberculosis in man and in animals, and the relations between the disease in human beings and in animals has been under careful investigation during recent years both in this country and abroad, and various phases of the question have been inquired into by successive Royal Commissions. So far as regards the possibility of the transmission of the disease from affected bovine animals to man, the Board are satisfied that it must now be accepted as a fact that tuberculosis is transmissible by the agency of milk used for human consumption. The Local Government Board concur in this view, and a Bill was introduced in the House of Commons by the President of the Local Government Board on the 25th instant designed, *inter alia*, to afford protection to the public health from the risk of the spread of tuberculosis by the means of milk used for human consumption.

3. It appeared to the Board of Agriculture and Fisheries desirable that their Order should be made and issued at the earliest possible moment in order that the proposals of the Government as a whole with regard to tuberculosis might be placed before Parliament. The Board intend at a later stage to address a further letter to your Local Authority, dealing more particularly with points of administrative detail connected with their Order. For the moment, therefore, they propose to refer only to the broader aspects of the subject.

4. In considering the question in relation to animals, the fact that the disease is communicable to man by milk has a material bearing on the measures to be adopted. Any action which results in the reduction in the number of tuberculous bovine animals in the country must reduce the risk of the spread of tuberculosis amongst the community, and if it were possible to eradicate from this country the disease in animals, a material step forward would have been taken in the campaign against the disease in man.

5. It is abundantly clear, at the same time, that any operations aiming at the diminution or eradication of tuberculosis in animals must be commenced with caution and carried out with due regard to the extent to which the disease is believed to exist amongst cows and the importance of securing the continuance of an adequate milk supply, and also of avoiding any disorganisation of the important industry concerned.

6. The Board have accordingly decided that their first endeavour should be to secure the destruction of every cow found to be suffering from tuberculosis of the udder, and also of all bovine animals which are emaciated from tuberculosis, since these are known to disseminate freely the germs of the disease. Any cow which is proved to be giving tuberculous milk should also, in the opinion of the Board, be similarly dealt with. By such means the Board conceive that a check will be placed upon the spread of the disease, and the way cleared for any future action which may, in the light of experience, be considered necessary and practicable in the public interest. The Order accordingly deals only with the forms of tuberculosis above set out.

7. Local Authorities for the purposes of the Diseases of Animals Acts are charged with the duty of investigating reports received under Article 2 of the Order, with the assistance of a Veterinary Inspector, with a view to causing the slaughter of any animal in their District shown to be suffering from one of these specified forms of tuberculosis. Under Article 3 of the Order the Veterinary Inspector will be able to extend his examination to any bovine animals upon the premises that have been associated with a suspected animal, in order that he may at the same time take steps to deal with any other bovine animal which in his opinion presents clinical symptoms of tuberculosis; and for the purpose of assisting him in his diagnosis as regards such animals he may, but only with the written consent of the owner of the animal, apply the tuberculin

test to any such animal. Power is also given to the Veterinary Inspector to take samples of milk and of faeces, urine and abnormal discharges, the intention being that he shall make use of bacteriological methods for the purpose of diagnosis.

8. The Local Authority are required by Article 4 of the Order to cause every animal found by them to be diseased within the meaning of the Order to be slaughtered. The animal to be slaughtered is to be valued in its condition at the time of valuation. Inasmuch, however, as the clinical diagnosis made by the Veterinary Inspector prior to slaughter may not be confirmed on post-mortem examination, it is provided in sub-section (3) of Article 5 of the Order that there shall be separate valuations on the basis both of the animal proving to be affected with tuberculosis and of its proving to be not so affected, and the amount of the compensation will depend on the result of the examination.

9. The compensation payable by the Local Authority for an animal slaughtered under their direction in cases in which the post mortem examination does not show tuberculosis is a sum equal to the full value of the animal and a further sum of twenty shillings.

10. Where tuberculosis is found the proportion of the value of the animal payable by way of compensation to the owner is made to depend upon the extent of the disease which is present. The Royal Commission of 1898 made certain recommendations with regard to the meat of tuberculous animals (see pages 20–22 of their Report), and the Local Government Boards for England and for Scotland adopted those recommendations and issued Circular Letters in the year 1899 for the guidance of Meat Inspectors as to the degree of tubercular disease which, in their opinion, should cause the carcase of an animal, or part thereof, to be seized under the Public Health Acts. The Board of Agriculture and Fisheries have accordingly adopted this classification as a basis by which the proportion of compensation payable under their Order is to be determined.

11. The degrees of tuberculosis described in Article 7 (4) of the Order are those which in the opinion of the Commissioners justify the seizure by Meat Inspectors of the entire carcase and all the organs thereof. Wherever such conditions are certified to exist the compensation is fixed at a sum equal to one-fourth of the value of the animal or the sum of two pounds, whichever sum is greater, after deducting from this compensation one-half of the costs incurred by the Local Authority for any valuation of the animal by a valuer appointed by the Board or for any examination of its carcase by a veterinary surgeon other than the Veterinary Inspector. For convenience these conditions are described in the Order as 'advanced' tuberculosis. In all other cases of disease, namely – in those where a carcase, if otherwise healthy, need not in the opinion of the Commissioners be condemned under the Public Health Acts except as regards the portions containing tuberculous lesions – the compensation is to be a sum equal to three-fourths of the value of the animal after deducting from this compensation one-half of the costs of valuation and examination as in the preceding case.

12. The Order prescribes the precautions to be taken in respect of the milk, &c., of suspected animals (Article 8), and their detention and isolation whilst under suspicion (Article 9). Provision is also made in Article 10 of the Order for dealing with suspicious animals exposed in Markets, Fairs, or Sales.

13. The Order has only been made after very careful consideration of the liabilities which are thrown upon the Local Authority. The Board believe that public opinion is favourable to the adoption of concerted measures designed to check the spread of tuberculosis throughout the country, and no such action can be satisfactory which fails to make provision for dealing

with the disease in the animal. Heroic measures in this connection would only defeat their own object, but a well-devised scheme for gradually reducing the prevalence of tuberculosis in animals should, the Board feel, carry with it a full measure of public sympathy and support. The payment to agriculturists of reasonable compensation for animals slaughtered in the public interest must in the opinion of the Board be an essential feature of any such scheme. On the other hand the liability of the Local Authority to provide such compensation on the present basis from public funds is a serious one, and cannot be continued unless events show that a return commensurate with the burden imposed is being obtained. It behoves agriculturists, therefore, to second the efforts of the public authorities by themselves taking measures to eradicate the disease entirely from their herds by segregating all bovine animals which respond to the tuberculin test, so as to prevent tuberculosis from being spread within the herd and the Board will be prepared to advise how this can best be done in particular cases.

14. The Board desire at the same time to point out to Public Health Authorities that any extension in particular localities of the measures now to be taken throughout the country generally, may prejudice their general utility. The danger to the public health from the milk of a cow presenting no clinical symptoms of tuberculosis and not giving tuberculous milk, even should it re-act to the tuberculin test, is admittedly small, and stockowners cannot be expected to pursue the course suggested above unless they are satisfied that re-action to the tuberculin test will not expose their herd to administrative action on the part of Public Health Authorities. It is earnestly to be hoped, therefore, that Public Health Authorities and their Officers will as far as practicable conform in their procedure to the lines laid down in the Board's Order.

15. It is inevitable that at the outset of the operations the expenditure of Local Authorities should comparatively speaking be heavy, inasmuch as the first effects of the Order will be to bring within its purview the cows of all ages suffering from chronic disease of the udder and bovine animals of all kinds which show signs of emaciation. When, however, the Order has been in operation for a few years there will only fall to be dealt with animals which from an outwardly healthy condition develop these forms of the disease. It must not, therefore, be supposed that the expenditure during the initial years will represent the ultimate average cost.

16. The Board would be glad if you would lay this letter before your Local Authority for their consideration in connection with the Bill now before Parliament. In view, however, of the fact that the Order does not come into operation until the commencement of next year, the Board do not think it necessary for your Local Authority at present to proceed with the publication of the Order in their District in accordance with the provisions of the Diseases of Animals Act, 1894.

I am,

Sir,

Your obedient Servant

T. H. ELLIOTT

Secretary

The Clerk of the
Local Authority

27 May 1909

The next five or six years, to the outbreak of the First World War, was a period of immense importance to the Department, particularly in the demand for the development of research and in the receipt of reports of various commissions and committees

on matters of veterinary interest. Before dealing with these some of the legislative procedures introduced by the Board after Stockman's appointment must be briefly considered. In 1906 a private member's Bill was introduced to amend the 1894 Act so as to permit the importation of Canadian live cattle to Great Britain without their being subject to the provisions of the Act in regard to slaughter and quarantine. The Bill was withdrawn when it became apparent that there was a majority against such a concession. It was 1923 before importations of Canadian store cattle were permitted.

In 1910 a Bill was introduced to amend the Diseases of Animals Acts of 1894 and 1896 in regard to the export of horses. This Bill, and a second re-enforcing one in 1914, were enacted to ensure that horses transferred to the Continent for slaughter for human consumption were not exposed to cruelty or unnecessary suffering. Section I of the Diseases of Animals Act 1910 read:

It shall not be lawful, except in such cases as may be prescribed by Order of the Board of Agriculture to ship or attempt to ship any horse in any vessel from any port in Great Britain to any place outside Great Britain, unless immediately before shipment the horse has been examined by a Veterinary Surgeon appointed by the Board for that purpose, and has been certified in writing by him to be capable of being so conveyed without cruelty both during the intended voyage and after being disembarked. The owner of the horse shall pay to such Veterinary Surgeon in respect of such examination such fees as may be fixed by the Board, and such certificate shall be delivered at the time of shipment to the Master of the vessel on which the animal is shipped, who shall on demand produce the same to a constable or any inspector or other officer of the Board or Local Authority, and allow such person to take a copy of or extract from, the certificate.

The Act also empowered the master of the vessel to order the slaughter of any horse seriously injured during the voyage, and every vessel should carry 'a proper killing instrument approved by the Board of Agriculture for that purpose.'

Exemption from the veterinary examination and certificate was allowed in the case of horses shipped to any port outside Europe as the cost of freightage was so high as to make it unprofitable to send unfit horses very long distances. Thoroughbreds being transported for racing or breeding purposes were likewise exempted.

Writing on this subject many years later (1927) Sir Francis Floud said:

At one time allegations were made that the Orders of the Ministry were not being enforced with sufficient severity, and that decrepit horses unfit to travel or work were being exported. A considerable public agitation was aroused, though the principal ground of complaint was in regard to the treatment of the horses after their arrival on the Continent on their way to and in the slaughterhouses. The Ministry could not be held responsible for the treatment of horses in a foreign country, but so far as possible arrangements are made for the slaughter of the horses in this country, so that the foreign demand for horse flesh may be met by the export of carcasses

rather than of live animals . . . any reasonable ground for complaint of the trade has been removed, except on the part of those who object to any horse being slaughtered for human consumption.

Since May 1870 when the Privy Council passed the Transit of Animals Order, with clauses for the prevention of cruelty to animals during transportation, the Department had always been mindful of the welfare of animals both at sea and on land. Many of the regulations were conjoined in 1911-12 under the Protection of Animals Acts. The general law for the prevention of cruelty to animals is, of course, under the administration of the Home Office.

In 1907 a new approach to the glanders problem was introduced by the Board in an Order which enabled the local authority, after an outbreak of glanders had been confirmed, to submit, with the consent of the owner, any horse to the mallein test if there was reason to believe that it had been in contact with an infected animal.

When Stockman dealt with glanders in South Africa after the Boer War it had been a fairly simple problem. The majority of the equine population was distributed throughout the Transvaal in relatively small defined areas and the mallein test could be applied with a reasonable chance of detecting the disease in its early or 'occult' phases. In Great Britain, as George Brown had pointed out more than thirty years earlier, and before mallein had been developed, it was extremely difficult to track down and eliminate this insidious disease in the crowded stables of London; the chances of contact between healthy and infected horses were enormous.

By this new approach it was hoped to discover and destroy the 'occult' cases before they had had time to spread the infection elsewhere. Satisfactory progress was made by this change of policy, but it was significant that of the ninety-seven confirmed outbreaks in 1914, sixty-seven occurred in the Metropolitan Police area and nineteen in collieries. Fourteen more years were to pass before the last outbreak was dealt with in 1928 and it is probable that even then the replacement of horse transport by mechanical traction played some part in expediting the eradication of the disease.

The only other legislation of this period which requires comment was the Tuberculosis Order of 1913 which was suspended in 1914 at the outbreak of war; but, since the Order was re-introduced in 1925, it will be considered in the post-war period.

To return now to the development of research and to the reports. In 1909 the Board transferred its laboratory service for the routine diagnosis of notifiable diseases, and for the investigation of various epidemiological questions arising therefrom, to Alpertown and it was specifically understood that any other diseases of stock, not included under Orders but brought to the notice of the Board's officers, would be investigated. Stockman clearly had influence here (possibly aided and abetted by his father-in-law John M'Fadyean) in the establishment of veterinary research in its

own right. Within a few years the research had outgrown Alpertons and the laboratory activities were transferred to Weybridge where, with a grant of £30,000 from the Development Commission, a laboratory had been started in 1914 and maintained for several years at the expense of the Development Fund. Owing to the war the Laboratory was not occupied until 1917.

Although some of the reports impinged only indirectly on the activities of the Veterinary Department, reference to them helps to show the gradual, if slow, build-up of official appreciation of the importance of veterinary medicine to the general welfare of the nation's livestock. In 1910 the Lord Carrington Committee reported its findings on the 'Export of Livestock'. The first of its recommendations was to the effect that the export of inferior or unsuitable pedigree stock should be discouraged and that to this end we should, as far as possible, try to appoint consuls who had some knowledge of British pedigree livestock and who could act as suppliers of information on this subject to those countries to which they were accredited—information which the Board of Agriculture would collect and supply. From the Veterinary Department point of view the anxiety shown by this Committee over the methods of testing for tuberculosis was of considerable importance. It had not taken long for some people to discover that the reactions to the subcutaneous test could be so interfered with as to render that test more or less useless in certain circumstances. It seemed desirable, therefore, that the governments of importing countries should be invited to appoint officers in this country to take the responsibility of supervising the export arrangements for their own animals. If, however, those governments declined, they should be asked whether they would recognise a certificate issued from a government testing station in this country, always assuming that the expenditure on such a station would be considered justifiable. In the meantime, regulations to prevent the falsification of tests, by inoculation or otherwise, with intent to defraud, should be drawn up. The particular attention of the veterinary schools should be called to the importance of providing thorough instruction in all aspects of the application of the tuberculin test. Moreover, the law should be strengthened, if necessary, in order to penalise a person who obtained, by false pretences, a certificate of registration of an animal or who fraudulently used any such certificate. Finally it was recommended that 'official assistance should be given for research work as regards the prevention and cure of contagious animal diseases'.

The Report of the Departmental Committee on Foot-and-Mouth Disease in 1912 discussed in some detail the methods of appointment and qualification of veterinary inspectors under the Diseases of Animals Act. It observed that the Board required these inspectors, after graduation and a probationary period of two years, to pass written and practical examinations in advanced pathology and epizootiology. This necessitated their engagement in post-graduate study, special facilities being provided for their attendance at a post-graduate course. The local veterinary inspectors of the

Board as well as those of the local authorities were, on the other hand, usually chosen from available veterinary surgeons in private practice, and the majority of these could not spare the time necessary for a complete post-graduate training. The Committee was therefore of the opinion that 'in view of the progress of veterinary science in its application to the control and eradication of contagious diseases, the subjects grouped under epizootiology could only be adequately taught in post-graduate courses of a practical kind'. In expressing this view the Committee had no desire to minimise the valuable services which the veterinary profession had rendered in the suppression of contagious diseases of animals, and, in this connection it recognised to the full the fact that the remuneration offered to veterinary inspectors by local authorities was insufficient to attract the services of specially qualified men. The Committee therefore strongly recommended that the appointment of all veterinary inspectors of local authorities should be in accordance with uniform rules relating to qualifications as laid down by the Board of Agriculture. It also thought that it was imperative that every local authority or group of authorities should have at its disposal the services of a chief veterinary officer with special qualifications in veterinary science and practice, who should not engage in private practice.

The Committee finally 'placed on record their approval of the procedure adopted by the Board of Agriculture and Fisheries in dealing with outbreaks of the disease, and consider that the freedom of this country in recent years from widespread epidemics was due to the regulations so admirably carried out by the Officers of the Board and those of the Local Authorities'.

Following this report, Walter Runciman, as President of the Board of Agriculture, appointed a departmental committee under Sir Alfred Hopkinson on 30 August 1912 'to inquire into the requirements of the public services with regard to the employment of officers possessing veterinary qualifications and to consider whether any further measures can with advantage be adopted for the selection and training of students with a view to such employment'.

After hearing evidence it was quite obvious to the Committee that there was an inadequate supply of suitable candidates for civil appointments at home, as well as in the Colonies and in India. As the number of veterinary surgeons in private practice appeared to be sufficient the problem which presented itself to the Committee was: 'How can the number of young veterinary surgeons fitted for, and desirous of, appointments in the Government Services best be increased, without causing an undue increase in the number of veterinary practitioners?'

One factor that impressed itself very much on the Committee was that no specific provision had ever been made for the education of veterinary officers who were to be employed in research and administrative work beyond that required for the ordinary practitioner. Some witnesses related the paucity of applicants for official posts to

the low scales of salary authorised for such posts. The Committee, however, did not believe that this alone was a sufficient explanation. It felt that it was necessary first to seek or produce conditions that would 'encourage a larger number of young men who had continued their general and scientific education beyond secondary school age to enter the profession'; and secondly, 'to provide for men who had qualified as veterinary surgeons, better facilities to extend their knowledge, more especially in the direction of specialisation in one branch of veterinary science.'

Stewart Stockman, giving evidence, had been emphatic on 'the necessity of research being undertaken into the nature of a disease before the adoption of administrative methods with a view to its suppression or control'. He said that the necessity for such research in animal pathology had been recently recognised by the Development Commissioners and the Treasury, who had agreed to the payment of a considerable annual grant from the fund for this purpose¹. The general conclusions of the Committee may be summarised thus:

- (i) That for all practical purposes no channel existed between the universities and the veterinary schools and that few university graduates were to be found there as a result;
- (ii) that the course for the qualifying diploma was not of itself sufficient training for future officers in the Government services;
- (iii) that the existing post-graduate courses, while of great value so far as they went, were not sufficient;
- (iv) that student and post-graduate scholarships should be provided;
- (v) that the time had come when increased financial assistance should be given by the Government to institutions devoted to veterinary teaching, the efficiency of which was of great importance to the State.²

The admitted aspirations of the Development Commissioners to improve veterinary education and research as a result of these findings were, however, frustrated by the outbreak of war in 1914 and their schemes, along with so many others, were destined to be shelved for the next four or five years. At the end of hostilities, when the difficulties and readjustments of the demobilization period had been surmounted, the Development Commissioners, recognising the great part that agriculture had played in our survival, set up in November 1920 an advisory committee of eminent medical and veterinary research workers

¹ An interim research grant was paid by the Board from the Development Fund during the financial year 1911-12 of £1,290 to the Royal Veterinary College to investigate vaccination against tuberculosis, an obscure disease of sheep, Johne's disease of cattle, and toxicology.

² The Development Commissioners allocated to the Royal Veterinary College for educational purposes £800 (1909-10); £1,300 (1910-11); £1,300 (1911-12).

to report on the facilities now available for the scientific study of the diseases of animals, to indicate what extension of those facilities is desirable in the immediate future in order to advance the study of disease, whether in animals or man, and to advise as to the steps which should be taken to secure the aid of scientific workers in investigating diseases in animals.

The Committee, after referring back to the 1913 Report, stated in no uncertain terms that in its opinion the lack of support for veterinary education and research was basically the reason for the deficiency of trained veterinary research workers in this country.

It would appear that the five Veterinary Colleges, which should occupy a place in relation to veterinary research similar to that enjoyed by medical schools and hospitals in regard to medical research, received in the year 1920-21 in the aggregate a State subsidy amounting to £3,696 for research purposes. Having regard to the position held by this country in the stock-breeding world such a condition of affairs constitutes a national disgrace.

Educationally, the Committee was firmly convinced that the veterinary colleges were starved for lack of adequate State support. As an example, 'the total income of the Glasgow Veterinary College in 1919-20 was £2,000, and of this sum £996 had to suffice for the salaries of 10 professors'. The members went to some pains to point out what the Commissioners would have done had it not been for the financial stringency produced by the war, but conceived it 'their duty to state quite clearly what the position was at the time of their reporting'. More than twenty years and another world war were to pass before the Loveday Committee made the second of its two reports, virtually on the same points, in regard to veterinary education and research. That time, however, its recommendations were accepted in full by the Minister of Agriculture, Tom Williams.

In 1912 a small Departmental Committee on Foot-and-Mouth Disease (J. M'Fadyean, A. E. Mettam, S. Stockman) was appointed by Walter Runciman 'to make further investigations as to the characteristics of foot-and-mouth disease, and the manner in which it is contracted and spread'.

Owing to the highly infectious nature of the virus it was decided to carry out this work in India where the disease was endemic. Here, unfortunately, the experimental team ran into an unforeseen difficulty in that the indigenous cattle showed an extraordinary irregularity in their reactions to exposure to infection, making it almost impossible to draw any reliable conclusions from the experiments. In the concluding parts of the report the writers said:

We think that, in the light of the experience gained, it would be inadvisable to consider the question of further investigation in India, but having regard to the importance of the subject, we venture to make suggestions in relation to a future investigation elsewhere. Foot-and-mouth

disease, so far as Europe is concerned, is of international importance. The success of measures to exclude, control or eradicate the disease in any particular country is, unfortunately, not wholly dependent on that country's own efforts, though Gt. Britain, from its insular position and the amount of control which can be exercised over importation of animals, is probably more favourably placed in this respect than any other European country. It is admitted, however, that every case of the disease arises directly or indirectly from another, and the experiences of this country show that in spite of its advantages of position, the virus of Foot-and-Mouth Disease may enter in some as yet unknown ways.

This research coincided with one of the most widespread epidemics of foot-and-mouth disease that had taken place in this country for years ; so widespread, in fact, that it became necessary to recruit the help of many temporary inspectors before the disease was brought under control.

In discussing an alternative location for such a research station in Europe, the Committee said that it did not favour its being placed here or on any adjoining island, but that it understood 'that Germany and France have established stations on islands and we venture to suggest the possibility of collaboration for the investigation of Foot-and-Mouth disease under European conditions'. This, however, was not to be, because by the time the report appeared in 1914 France and Great Britain were at war with Germany.

An Historical Survey

1914-1964

IN 1914 the transport of the Army depended almost entirely on the horse and mule; cavalry, field guns, artillery columns, Army Service Corps and the rest. It was only in the later stages of the conflict that mechanical transport developed so that it gradually displaced, but never quite replaced, the horse.

It was almost inevitable, therefore, that in assembling vast numbers of horses and mules from all quarters of the world, mange and glanders, those twin scourges of the war-horse, should make their appearance in spite of the availability of mallein as a diagnostic agent. This was a problem for the Army and led to every able-bodied veterinarian being enrolled for military service, quite rightly if one may judge from a single example in a Kentish village where, in 1915, an enthusiastic sergeant was discovered insufflating iodoform powder into the discharging nostrils of a line of glandered horses. At home, several progressive measures requiring veterinary staff were temporarily suspended, the remaining members of the profession being fully occupied in the routine work of their practices.

The reduction of imports enforced by the submarine blockade meant that farmers had to make prodigious efforts to save the country from starvation. In the event they just succeeded until relief came with the Armistice of November 1918.

So, agriculture had come into its own again. In a matter of months the Board of Agriculture and Fisheries was raised to the status of a Ministry and it was freely said that the industry must never again be so neglected by Government as it had been in the past. But there were some among the farming community who had studied history and who understood that it showed a tendency to repeat itself. They recalled what they had read of the fate of their industry in the years that followed the Napoleonic wars, so that they pressed for a State policy for agriculture whilst enthusiasm was still high. The Agriculture Act of 1920 was the result. But, within the year, the Repeal Act of 1921 virtually destroyed what had been regarded by many as a charter for agriculture. Political indecision and changes of policy disheartened farmers, and many felt it was safer to switch from arable farming to the production of fresh meat, milk and vegetables. From the veterinary point of view this change was apparently all to the good. The powerful support of Sir Alfred Hopkinson's Committee for veterinary education and post-graduate training, and the favourable intentions expressed towards the

veterinary cause by the Development Commissioners had, in 1914, been filed away 'for the duration'. Now, under the pressure and enthusiasm of the moment, the Commissioners set up in November 1920 an advisory committee on veterinary education and research which reported in no uncertain terms that the veterinary profession as a whole had been grossly neglected by Government for many years. Unfortunately, the hopes engendered by the recommendations of this committee suffered a somewhat similar fate to those raised by the 1920 Agriculture Act.

When the Board of Agriculture and Fisheries became a Ministry the Veterinary Department was re-designated 'The Diseases of Animals Branch', with Sir Stewart Stockman still the Chief Veterinary Officer. The year 1919 was not without its anxieties. Rabies had been imported into Plymouth from abroad, probably about May 1918, but it was not till the end of August that the Ministry learned of the possibility of its existence and was given an opportunity of investigating and dealing with the situation. The details of this outbreak, which lasted for four years before being finally eliminated, are told elsewhere in this book. Sir Stewart's observations in his Annual Report on the year 1919, on the work of diagnosing and dealing with contagious diseases, with particular reference to rabies, are worth recording:

The first essential in combating a contagious disease of animals is rapid and accurate diagnosis; the second is to pounce down upon it without mercy, as it were, allowing it no latitude in the way of spreading. The first, in the case of rabies, demands the organised assistance of the laboratory with its finer methods of diagnosis, aided by clinical skill and experience on the part of those working in the field. The second requires a field staff well versed in the epizootiology of the disease, and the tricks it may play. It also, unfortunately, requires a considerable knowledge of the tricks which may be played by owners of dogs, for there are few diseases in which disregard of regulations on the part of owners of animals may be followed by such appalling consequences.

There is a wealth of truth in those few lines.

Besides rabies, there was also an increasing number of outbreaks of foot-and-mouth disease. How the virus kept reaching these islands appeared to Stockman 'as mysterious as it is interesting'. After a philosophical consideration of the possibility that migratory birds might be responsible for some outbreaks he came to the conclusion that, on the evidence available, this was not the explanation. He favoured the idea that, when foot-and-mouth disease was prevalent across the Channel, particles of virus might be carried through the air and over the water by suitable winds. His worries were to continue because, after a considerable improvement in 1921, there developed the most widely spread epidemic of foot-and-mouth disease that this country had suffered since 1884, eventually reaching alarming proportions in the winter of 1923-24. There was the usual public outcry against the stamping-out policy and, because the incidence of the disease had been so exceptional, two departmental committees were

PLATE I



The First International Veterinary Congress held in Hamburg 14-18 July 1863, organised by John Gamgee who is seated second from the left

50 49 48 47 45 44 43 42 41 40 39 38 37 36 35
 26 25 27 24 28 23 29 22 30 21 20 19 18 17 16 15 14
 1 2 3 4 5 6 7 8 9 10 11 12 13


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|----------------------|----------------|---------------------|---------------|-----------------------|
| 1 Nicklas | 11 Fürstenberg | 21 J. F. Stockfleth | 31 Kaltschmid | 41 Oefsti |
| 2 Gamgee | 12 Field | 22 G. May | 32 Schanz | 42 Krummbiegel |
| 3 Röhl | 13 Köhne | 23 Zangger | 33 Schmidt | 43 Zipperlen |
| 4 Falke | 14 Schmelz | 24 H. V. Stockfleth | 34 Jacoby | 44 Wittmack |
| 5 Hering | 15 Castres | 25 Kinburg | 35 Eggers | 45 Köllisch |
| 6 Hertwig | 16 Probstmayr | 26 Heinsen | 36 Marcus | 46 Jwersen |
| 7 Gerlach | 17 Undritz | 27 Adam | 37 E. Schramm | 47 Unterberger (Jun.) |
| 8 Unterberger (Sen.) | 18 Pillwa | 28 Walther | 38 Schlüter | 48 H. Schramm |
| 9 Leisering | 19 Hornthal | 29 Flock | 39 Schmack | 49 Frauen |
| 10 Wüst | 20 Pehrsson | 30 C. R. May | 40 Stöckle | 50 Rörtger |

PLATE II



One of the many stones set up in various parts of the country to commemorate the Great Cattle Plague of 1865-67. This one was erected by a Shropshire farmer whose descendants are still farming the same land

PLATE III

No.  Not to be used for removal to or from the Boroughs of Bradford, Dewsbury, Doncaster, Halifax, Leeds, Pontefract, Ripon, Sheffield or Wakefield.

LICENCE TO REMOVE CATTLE

WITHIN THE WEST RIDING JURISDICTION.

I HEREBY PERMIT the removal of

NO. DESCRIPTION.	REMARKS.
2. COW	Red & White
HEIFER	
BULL	
3. BULLOCKS	Red & White
OX	
CAL	

the property of *John Groves of Collingham*
 from *Wetherby*
 to *Collingham*
 being ^{lean or Store Animals.} ~~for immediate Slaughter.~~

This Licence shall remain in force until *Satur* day
 next, the *22* day of *Decr* 1866.

Given under my hand this *22* day of *Decr* 1866.†

(Signature) *Harewood*

* Strike out one of these lines, as the case may require.
 † To be dated at the time of issue.

L.P.T.O.

Facsimile of a licence to remove cattle, issued under the Cattle Diseases Prevention Act 1866, signed by the Earl of Harewood in his capacity as Justice of the Peace

PLATE IV

Addington Park
Jan 22. 1866

Sir

The continuance of the latter flag with unabated severity appears to call for the appointment of a Day of National Humiliation. I am daily addressed by persons coming in all quarters of the Kingdom, entreating me to urge Her Majesty's Government to a decree. The Queen to issue an order to that effect.

I earnestly hope that such advice may be given, and that an early day may be appointed for such purpose -

I have the honour to be

Sir

Yours faithful servant

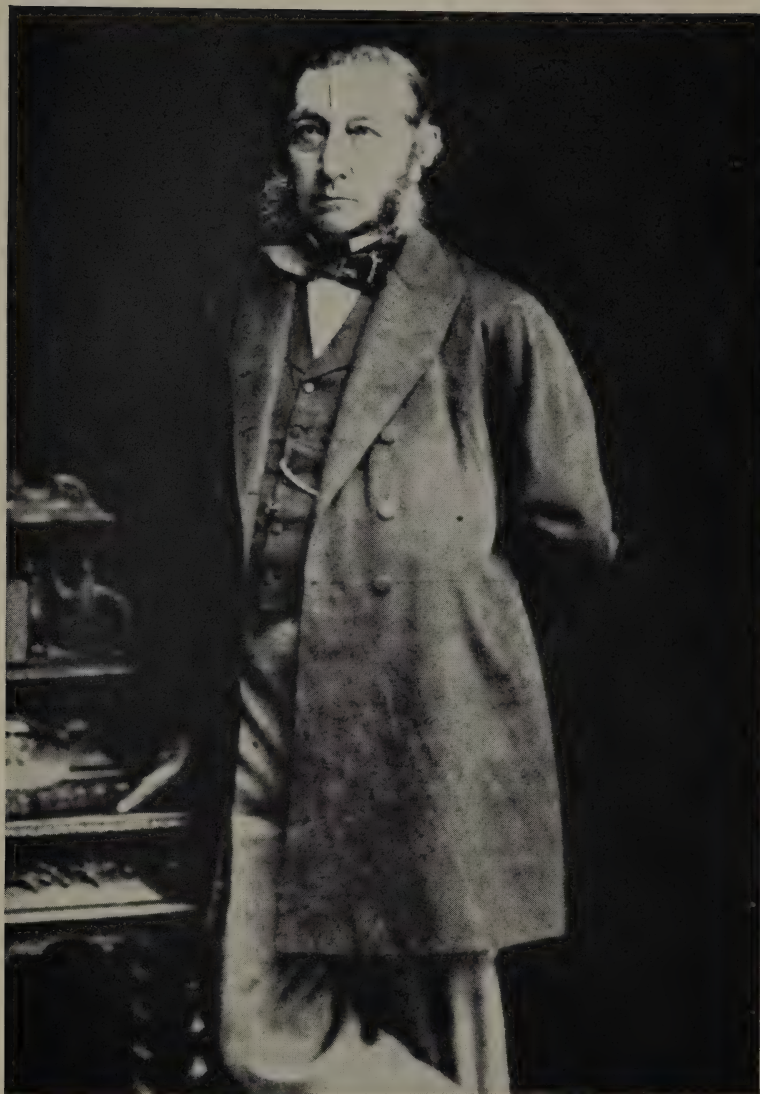
C. J. Courtenay

At. Am.

Sir George Grey Bt.

Facsimile of a letter written on 22 January 1866 by the Archbishop of Canterbury to Sir George Grey, Home Secretary, petitioning for a day of national humiliation.

PLATE V



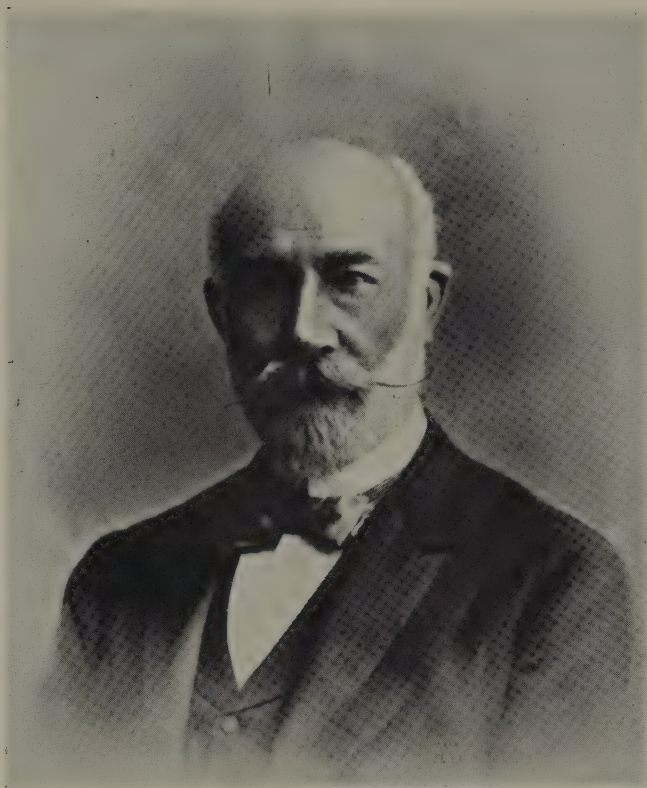
Professor James Beart Simonds, MRCVS
Chief Veterinary Adviser to the Privy Council
Retired 1872
Died 5 July 1904
Past President of the Royal College of Veterinary Surgeons

PLATE VI



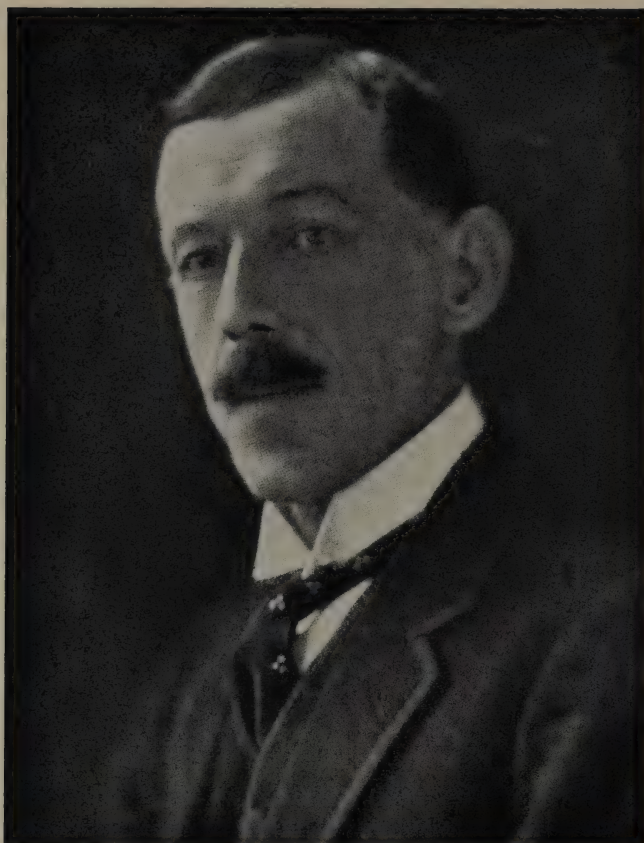
Professor Sir George Thomas Brown, CB, MRCVS
Honorary Associate of the
Royal College of Veterinary Surgeons
Chief Inspector to the Privy Council 1872-77
Appointed Professional Officer of the Veterinary Department
of the Privy Council 1 January 1877
Appointed Director of the Veterinary Department of the
Board of Agriculture 1890
Retired 30 December 1893
Knighted 1898
Died 20 June 1906

PLATE VII



Alexander Curtis Cope, MRCVS
Chief Veterinary Officer: appointed 30 December 1893
Retired 31 December 1904
Died 29 May 1906
Past President of the Royal College of Veterinary Surgeons

PLATE VIII



Sir Stewart Stockman, MRCVS
Chief Veterinary Officer and Director of Veterinary Research
Appointed 1905
Knighted 1913
Died in office 2 June 1926
Past President of the Royal College of Veterinary Surgeons

appointed in 1924. One, a scientific committee, was to investigate the pathology of the disease and to this end in 1925 an experimental station was established with foot-and-mouth disease as one of its main studies at what had been the Cattle Testing Station at Pirbright. This was a bold move, particularly in view of the recommendations of the 1912 Foot-and-Mouth Disease Committee (of which Stockman and M'Fadyean were members) that such research should not be carried out in this country nor on any adjoining island. However, what is now called the Animal Virus Research Institute, Pirbright, has more than justified the judgment and confidence of those who made the decision to establish it here on the mainland, because it has since become recognised as the foremost centre in the world on foot-and-mouth disease and as the World Reference Laboratory open to full international use in the campaign against this disease.

The other was a departmental committee under the chairmanship of the Rt Hon E. G. Pretymann and it reported early in 1925 with recommendations for the control of foot-and-mouth disease. It is interesting to record an extract from the preface to this report, obviously in reply to some of the lay criticisms of the Ministry's policy:

The disease is not usually fatal to the animals attacked, as the proportion of deaths does not normally exceed 3 per cent in the case of cattle, with a rather higher figure amongst sheep and pigs. It has secondary consequences which are described in our report, and are often serious, especially amongst dairy herds and breeding stock – but, even so, it cannot be reckoned a deadly disease, and this fact gives rise to much misapprehension. It is frequently urged that the disease is curable, that its effects are transitory, that animals treated with this or that specific have recovered, that in the outbreaks which occurred some half century ago when no restrictions were enforced losses were few, etc. – the assumption underlying all these propositions being that it is unnecessary to impose irksome and costly restrictions, and to slaughter animals in order to combat a curable disease. This is obviously true, and it is still more obvious that it cannot be profitable to slaughter an animal to save its life, and that if we were only dealing with individual animals which have contracted foot-and-mouth disease, a very different policy would be indicated. The real trouble with foot-and-mouth disease is not its deadliness but its extraordinary infectivity, and we do not have to consider its effects upon the animals actually attacked but upon the flocks and herds of the United Kingdom as a whole. Movement, both human and animal, is now much more extended than it used to be, and infection would constantly be carried from one part of the kingdom to another. Unfortunately, a diseased animal only has a very short immunity against another attack, and, although the actual losses by death might not in themselves be disastrous, if once foot-and-mouth disease were allowed to become endemic the total losses which would be suffered by breeders and dairy farmers would be gigantic, and all stock-owners would be faced with a constant and recurring menace, to say nothing of the effect on our export of pedigree stock which is of such high importance to the meat and wool trade of the world. Looked at from this standpoint, it will easily be seen that the object of the slaughter policy is not to cure the animals affected but to prevent the disease from spreading; or, in other words, we are not out to treat sick animals but to preserve healthy ones. It is for this purpose that restrictions are imposed, and for this

purpose that slaughter is authorised and heavy burdens borne by the taxpayers in the form of compensation.

Until the pathology of foot-and-mouth disease is better understood no other policy seems practicable, nor is there any conceivable means of avoiding those primary outbreaks which are apparently airborne so that the enemy is within our gates before we are aware of him. Primary outbreaks are most likely to occur when, as at the present time, foot-and-mouth disease is very prevalent in the Continent of Europe and in South America, and we can only take measures to limit and suppress such outbreaks at the earliest possible moment and with the least possible cost in money and inconvenience.

This statement, made in 1925, would apply with equal force today if the disease were 'very prevalent in the continent of Europe' and if there was not the present degree of veterinary control in South America. Fortunately, international co-operation in this matter has been attended with some definite success despite a number of severe intercurrent outbreaks.

It will be recalled that the Tuberculosis Order of 1909 was withdrawn by the Board of Agriculture before it had been applied by the local authorities. The Order was resuscitated with a few minor alterations in 1913 but was again withdrawn fifteen months later, along with the Milk and Dairies Act 1914, owing to the outbreak of war. The Milk and Dairies (Consolidation) Act of 1915 was likewise deferred. This had been drawn up to consolidate most of the previous legislation connected with milk production and was designed to empower local authorities to appoint veterinary inspectors for making periodical inspections of dairy herds, and for dealing with certain of the notifiable diseases as well as with bovine tuberculosis.

The Milk and Dairies (Amendment) Act 1922 authorised the Ministry of Health to grant licences for the production of so-called 'designated' milk. These powers were delegated the following year to local authorities by the Milk and Dairies (Special Designations) Order 1923 whereby the public could obtain four grades of milk: 'Certified', 'Grade A', 'Tuberculin Tested' and 'Pasteurised'. This was a milestone in the campaign for clean milk from healthy herds. A further advance was made in 1925 by the re-introduction of the deferred 1915 Act, as well as by the Tuberculosis Order which had been revoked in 1914.

In 1926 the local authorities were given considerable powers under the Milk and Dairies Order 1926 to enforce, through their veterinary inspectors, higher standards of health and cleanliness in the dairy herds in their areas, whilst similar legislation was enacted by the Scottish Board of Health. It was hoped by regular clinical inspection of all cows to eliminate at least the advanced cases of tuberculosis and thereby improve the safety of the milk. The number of cattle condemned in the first year as advanced cases of tuberculosis was alarming, as M'Fadyean had forecast many years earlier. What was disappointing, particularly to the local authorities, was the fact that the

number of cases dealt with each year under the Tuberculosis Order showed little or no tendency to drop and, in fact, it was in 1936 that the largest number was slaughtered under the Order in any one year. The Chief Veterinary Officer, in his Report for 1926, went out of his way to 'correct a prevailing and erroneous impression' that the Tuberculosis Order of 1925 had in view the eradication of bovine tuberculosis. 'It would not be practicable', he said, 'to achieve such an object as this without unduly depleting the herds of this country.' The object of the Order was 'to remove the source of immediate danger to human health, and also to reduce the amount of infection able to spread the disease to other animals'.

The veterinary staff of the county local authorities, augmented as a result of the milk and dairies legislation, together with the existing veterinary staffs of some of the bigger cities, now constituted a very important force in the struggle for healthier and cleaner conditions in herds and dairies throughout the country. The full history of these services would be of real interest. It has not so far been written, and is not of direct concern here except that its officers were to become part of the newly-formed Animal Health Division of the Ministry in 1938 and they brought with them knowledge and experience that were to be of great value as the work of the Division developed.

In May 1926 irrefutable evidence was obtained that three separate shipments of foot-and-mouth disease-infected pig carcasses and their offals had been landed in this country from the Continent. The Minister, in these circumstances, had no alternative but to prohibit entirely the importation into Great Britain of all carcasses (including offals) from the Continent and this he accordingly did by the Importation of Carcasses (Prohibition) Order, dated 2 June 1926.

On this same day Sir Stewart Stockman died whilst still in office. For twenty-one years he had fostered the development of veterinary knowledge by research in order better to administer and control diseases of livestock. He disliked the empirical approach that had dominated the veterinary scene for so long and he therefore was a staunch advocate of post-graduate training, particularly for his own officers. He, himself, worked hard to discover facts and to see them applied in the field. It is probable that nothing during his term of office gave him more satisfaction than the designing and development of the laboratory at New Haw, Weybridge. Here, research into such diverse subjects as swine fever, tropical and British redwater in cattle, the habits of ticks, bracken poisoning, ragwort poisoning, loup-ill and scrapie in sheep, and contagious abortion, was pursued as actively as funds would allow. There was another development which must have interested him but one that, unfortunately, he saw only in its very early stage. Before 1914 an Agricultural Advisory Service, with six centres in England and two in Wales, had been established to help farmers with their various problems through the visits of agricultural advisory officers. After the war the farmers, who had been very appreciative of the help received in this way, asked whether it

would not be possible to supply similar advice on veterinary matters. Consequently the first veterinary advisory officer was appointed at Cardiff and similar appointments were later made at Newcastle in 1923, at Bangor in 1924 and at Sutton Bonington in 1925. It is unlikely that Stockman foresaw that these advisory centres would grow into the Veterinary Investigation Service of the present day, but it is certain that this is something of which he would have whole-heartedly approved. Stockman's appointment had proved an unqualified success, and he left behind a vastly improved veterinary service to his successor, J. J. R. Jackson.

The impetus which Stockman had put into departmental affairs was not an easy thing for his successor to maintain in an atmosphere of increasing agricultural depression and financial stringency. Foot-and-mouth disease was still the major worry; the reference in the Pretymann Report to the possibility of introducing the virus here in chilled or frozen meat from South America had naturally provoked quite a lot of public interest and, behind the scenes, consultations between the Argentine Ambassador, his veterinary adviser, and various officials in this country took place 'as to what measures could be adopted to prevent the shipment of possibly infective carcasses from South America to Britain'. As it was not possible by ordinary examination to tell if a dressed carcase was infective, and no test, short of inoculating portions of the carcase into susceptible animals, was reliable, and then only if positive, it was concluded that any measure to prevent the shipment of infected carcasses must be applied in South America where inspectors would have the advantage of seeing the animals when alive and immediately after they had been slaughtered. After considerable and friendly discussion with the Governments of Argentina, Brazil and Uruguay it was finally agreed that one or more of the Ministry's senior veterinary inspectors should visit these countries. This was done in 1927 when a senior inspector was given every facility to study the whole situation. Eventually, however, a position was reached where negotiations were hanging fire and, on the invitation of the Minister, Lord Bledisloe agreed to undertake a mission to try and settle the outstanding points and, if successful, to ratify agreements with the three Governments. This he did with consummate skill, and the basic factors which he settled remain in force to this day although, in the light of experience, certain amendments have since been introduced.

In his Report for the year 1928 the Chief Veterinary Officer drew attention to two interesting occurrences. The first was the death of a dog from rabies whilst in quarantine. This, he said, was the eighth case so to die in ten years, and he took the opportunity of stressing that any one of these cases might have started a serious epidemic throughout the country if the dog had not been fully quarantined. The second was the occurrence of a case of glanders in a horse at Southampton in September of the same year. Although the clinical and post-mortem findings as described by the veterinary inspector of the local authority were apparently typical, Ralph Jackson had been under Sir Stewart

Stockman's influence too long for him willingly to accept a clinical diagnosis in such an important matter. As a result, and at his instigation, the Glanders or Farcy Order of 1929 gave the Ministry final responsibility for the diagnosis of glanders after examination of material submitted to Weybridge. This case, happily, proved to be the last outbreak of glanders in Great Britain.

Sir Ralph Jackson retired in May 1932. His Report for 1931 included an interesting valedictory contribution in the form of a brief review of the problems coming within the purview of the Diseases of Animals Act, together with some indication of the future outlook. After a survey of the notifiable diseases, particularly in regard to those that had been eliminated from the country, he went on to say

... there are other diseases which, if less spectacular, are nevertheless causing heavy losses to the livestock industry, particularly the dairy industry – notably, tuberculosis, contagious abortion, Johne's disease and mastitis, and certain diseases of swine, whilst some of the diseases prevalent amongst poultry are calling for greater attention.

Six months later the Prime Minister appointed the Economic Advisory Council Committee on Cattle Diseases, with Sir Gowland Hopkins as chairman,

to consider what practical measures can be taken to secure a reduction of disease among milking cattle in this country and to report upon any changes desirable in the existing administrative practice, and in particular, upon the value and practicability of methods for reducing the incidence of bovine tuberculosis and improving the milk supply.

The Committee reported on 16 April 1934, recommending that routine veterinary inspection of herds and dairies should be made obligatory for all local authorities; that the veterinary service should be expanded under the immediate control of local authorities, but with precautions designed to secure to the departments of agriculture the power to co-ordinate the activities of local authorities; that this expanded veterinary service should undertake the testing of herds with tuberculin for the purpose of the Milk (Special Designations) Orders, and that the veterinary officers of the local authorities should also be responsible for duties in connection with the eradication of tuberculosis. The Committee emphasised that the scheme for the eradication of bovine tuberculosis must be under the active supervision of the Ministry of Agriculture (and, in Scotland, the Department of Agriculture) and should provide for:

1. the institution of a list of tuberculosis-free herds (accepted herds), tested with tuberculin from time to time under official supervision, and declared to be free from bovine tuberculosis;
2. the provision of free advice and free tuberculin testing for owners of herds who agree to make *bona fide* efforts to free their herds from tuberculosis, or who have established free herds;
3. financial help, where necessary, by way of loans or the guarantee of loans, to approved owners for the purpose of undertaking expenditure required by the veterinary inspector as necessary to eradication;

4. the securing to owners of disease-free herds of a higher price for their milk than that obtained by other owners;
5. the taking of administrative measures designed to secure that tuberculosis-free cattle from accepted herds should be moved about the country and exposed for sale without running the risk of being brought in contact with other cattle;
6. the adjustment of regulations governing the production of graded milks and the grades of milk officially approved, and the making of regulations relative to the compulsory pasteurisation of milk with a view to increasing the incentive to farmers to eradicate tuberculosis from their herds.

The costs of the necessarily increased veterinary services and laboratory work, as well as the free tuberculin, should be met from national and local funds; the milk industry as a whole should find the sum required to pay the bonus on milk produced in accepted herds, and the farming community should bear the other costs incurred in eradication—but the State or local authority should, if necessary, facilitate the financial arrangements.

The Committee, whilst emphasising the importance of bovine tuberculosis in causing enormous losses to cattle owners, exposed at the same time the actual extent of the problem created for farmers by three other commonly occurring non-scheduled diseases of cattle; contagious abortion, Johne's disease, and streptococcal mastitis. Although these four insidious conditions (which had been specifically mentioned by Sir Ralph Jackson) were daily encountered by veterinarians, it is doubtful, until the publication of the Gowland Hopkins Report, if there was any appreciation of the magnitude of the aggregate losses from them. The public certainly had no conception, and farmers probably had little idea how severe were the indirect losses from these infectious diseases.

As a first move, the Minister of Agriculture and Fisheries and the Secretary of State for Scotland were empowered by Section 9 of the Milk Act 1934 to make 'arrangements', with the approval of the Treasury, for the expenditure of sums not exceeding £750,000 spread over a period of four years to assist in 'securing so far as practicable that the milk supplied for human consumption . . . is pure and free from the infection of any disease'.

In exercising these powers, arrangements were made by the Minister in 1935 firstly for the institution of the Tuberculosis (Attested Herds) Scheme for England and Wales; and secondly, for research, to be carried out partly at Cambridge and partly at Weybridge, into the application of the tuberculin test for the purpose of solving certain difficulties which had arisen in a small percentage of cases in interpreting the test.

The Attested Herds Scheme started on 1 February 1935 in England and Wales whilst a similar scheme commenced simultaneously in Scotland under the Department of Agriculture for Scotland. These two schemes provided facilities by means of which

an owner of a herd complying with certain conditions could apply for an official tuberculin test of his herd; if no reactors were found he would be entitled to a certificate of attestation and to have his herd entered in a Register of Attested Herds. The conditions to qualify a herd for an official test were that it must have been previously tested on behalf of the owner and that at the last two tests, carried out at an interval of from six to twelve months, no reactors had been found. The owner was also required to sign an undertaking that he would be prepared to comply with certain rules which were designed to preserve the freedom of the herd from the danger of re-infection with tuberculosis.

Whilst the Gowland Hopkins Report stated that 'the total eradication of bovine tuberculosis from all herds is the only complete solution of the problem of tuberculous milk', it also realised that, with approximately 40 per cent of cows infected throughout the country, the problem was of some magnitude. In these circumstances the Committee advocated a voluntary scheme for the establishment of a register of tuberculosis-free herds with certain financial incentives to their owners¹.

Although a considerable amount of propaganda was undertaken by the Ministry to bring the advantages of the scheme to the notice of farmers and their veterinary surgeons, the results of the first years, in view of the fact that there were already quite a number of herds known to be tuberculosis free, were disappointing. The main criticisms were that the conditions to be fulfilled by herd owners were too onerous, and that the outlay required in order to undertake and complete the eradication of tuberculosis from a herd was so large that very few farmers could afford it without greater financial inducements than those provided by the scheme.

It must be remembered that the financial depression in the agricultural community was now acute and it is understandable that many farmers had arrived at the point of wondering whether they might not be 'throwing good money after bad'. At this juncture the Minister of Agriculture, W. S. Morrison, obtained wide powers in the Agriculture Act of 1937 to encourage the improvement of agriculture generally.

This far-reaching legislation offered assistance to farmers to increase the fertility of their land; it guaranteed prices for oats and barley as well as raising 'the limit of the quantity of wheat in respect of which deficiency payments under the Wheat Act, 1932, may be made at the full rate'; it promised further grants for land drainage; and in order 'to promote the eradication of diseases of animals and poultry' it determined 'to establish a national service of veterinary inspectors'. The members of the several veterinary services—the veterinary inspectors of the Ministry of Agriculture and Fisheries, the veterinary officers of the Department of Agriculture for Scotland (responsible for the Attested Herds Scheme in Scotland) and the veterinary inspectors

¹ See page 223.

employed by the many local authorities throughout the country—were to be amalgamated into one ‘national service of veterinary inspectors’¹. As things stood at the time, veterinary functions under the Diseases of Animals Acts were discharged partly by local authorities and partly by the Ministry whilst the duties under the Milk and Dairies Acts and Orders were carried out entirely by local authorities. Considerable variations in interpreting the legislation under the Diseases of Animals Acts always existed between the various counties, and it will be recalled that Sir George Brown had complained that such division of authority and responsibility was inconsistent with planned operations on a large scale. This point was now well taken in Part IV of the 1937 Act.

Section 19(2) of this Part stated: ‘There shall be transferred and attached to the Ministry of Agriculture and Fisheries such veterinary inspectors or veterinary officers on the staff of any other Government Department as are engaged in the execution of such Acts, enactments or arrangements as aforesaid’, and that all the veterinary functions would now be discharged by veterinary inspectors appointed by the Minister under Section 5 of the Board of Agriculture Act 1889.

To close the void thus created in the local authority staffs the Minister agreed to make arrangements ‘for placing the services of veterinary inspectors at the disposal of such authorities’.

The Minister was empowered, in accordance with a scheme made by him and approved by the Treasury, to ‘pay to the owner of any herd of cattle in Great Britain such sums as the Minister thinks fit to expend for the purpose of securing so far as practicable that the herd will be free from tuberculosis’. He was likewise given the authority to expend such sums of money as he might consider necessary for the eradication of *any* disease of animals in Great Britain.

The Cattle Pleuro-Pneumonia Account, which had up to now been used for paying compensation, was to be continued, but under the name of the Diseases of Animals Account.

In view of the Gowland Hopkins Report, one of the more important sections of the Act was Section 23, particularly in connection with the Attested Herd Scheme. It said:

23. The powers of the Minister under section twenty-two of the Diseases of Animals Act 1894, shall include power to make orders—
 - (a) declaring any area as respects which he is satisfied that a substantial majority of the cattle therein are free from any particular disease to be *an eradication area*² for purposes connected with the control of that disease;

¹ In 1950 members of the staff became known as officers instead of inspectors. This did not interfere with their duties as inspectors under the Diseases of Animals Acts but it removed a word which many thought undesirable because it implied not only an official but an officious attitude.

² Author's italics.

(b) Declaring any area as respects which he is satisfied that any particular disease of cattle is for practical purposes non-existent therein to be an *attested area* for purposes connected with the control of that disease; and

(c) Prohibiting or regulating the movement of cattle into, out of or within any area which is for the time being an eradication area or an attested area.

24(1) With a view to promoting the breeding and distribution of stocks of poultry free from disease, the Minister may, with the approval of the Treasury, make arrangements whereby persons carrying on, at any premises in Great Britain recognised by him for the purposes of this section, the business of breeding and distributing stocks of poultry, may be afforded facilities for having such poultry, whether alive or dead, inspected, tested and examined free of charge, with the object of determining whether the birds are free from disease or from what cause they have died.

The actual transfer of the veterinary inspectors and officers to a single department of the Ministry of Agriculture and Fisheries took place on 1 April 1938. It can usually be taken as a *sine qua non* that when such a major re-organisation takes place smoothly someone in the background has carried out a lot of careful and, not infrequently, delicate preparatory negotiations. In this case the work of Donald Vandeppeer (later Sir Donald Vandeppeer, КСВ, КВЕ), at that time Assistant Secretary to the Division, was prodigious. To conform with this new approach under the Act, the Diseases of Animals Branch was re-designated the Animal Health Division. This newly created and augmented body was split into seventy-eight divisions, mostly on a county basis, each being placed in charge of a divisional inspector, and into twenty-two areas each in charge of a superintending inspector. Divisional offices were established in order to facilitate close liaison between the veterinary staff and the local authorities, who still retained important functions exercised by the agricultural and public health committees, as well as with the police. John Kelland, who had succeeded Sir Ralph Jackson as CVO in August 1932, and his deputies D. A. E. Cabot and E. C. Lloyd, supported by a staff of superintending and divisional inspectors, controlled the overall activities of the Division from the head office in Whitehall Place.

Although the Gowland Hopkins Report had expressed the opinion that only whole-time officers should be employed in the veterinary service, it agreed that the employment of part-time officers should be permitted 'as a temporary measure'. As a result two panels of general practitioners were appointed. *Panel A*, which eventually included nearly 70 per cent of such part-time appointments, was made up of those practitioners who were willing to undertake, in a specified area, any of the duties arising under the Diseases of Animals Acts and the Milk and Dairies Acts, and any of the Orders of the Departments that might be made under this legislation. *Panel B* was made up of practitioners who were eligible mainly for work arising under the scheme for eradication of diseases in the herds of their clients, and they also worked on a geographical basis.

The employment of veterinary surgeons in practice working on a part-time basis on Ministry duties has been so successful that it is now a permanent feature of the Division, although the arrangements have been somewhat modified. It brings the veterinary surgeon in practice into close co-operation in official work, it provides a service in every locality, and it sometimes encourages a practice to be set up or continued where otherwise it could not pay. The local veterinary inspector mainly works on the premises of his own clients although there is a special panel of inspectors who may work on a wider range of duties on any farm. At first only principals were appointed but, later, assistants were also accepted.

Sir John Kelland retired three months after the formation of the Animal Health Division and it was left to his successor, Daniel Cabot, to put the new organisation in motion.

In the Agriculture Act 1937 a change of emphasis was given to the Tuberculosis (Attested Herds) Scheme. The original scheme of 1935 had been based on the Milk Act of 1934 and was intended to ensure that milk supplied for human consumption was pure, and free from disease infection; but the scheme under the new Agriculture Act was drawn up to secure that the herd from which the milk came was free from tuberculosis. The Attested Herds Scheme, as revised, came into operation on 1 July 1938 and was, generally speaking, the same as the original 1935 schemes of the Ministry and the Department of Agriculture for Scotland, except that now all herds, dairy and beef, were included.

In 1938 and 1939 there was a significant increase in the numbers of attested herds compared with those of the first three years of the scheme. Then, with the outbreak of war, a limitation was put on the entry to the scheme to those herds producing certified or tuberculin-tested milk, and the scheme was not re-opened until July 1944. This imposed limitation proved in the event to be a blessing in disguise as far as the tuberculin test was concerned. When the Ministry decided to produce its own tuberculin at Weybridge it first studied the methods of production used by different countries and finally decided to follow the technique used by the Bureau of Animal Industry in Washington. The resultant Weybridge tuberculin in field trials proved to be more effective than previous tuberculins, and by May 1940 supplies had become adequate for use on all official tests. When, however, a little later, this tuberculin was used in established attested herds there was a considerable increase in the number of reactors, more noteworthy in herds which had been considered free from tuberculosis for some years. Post-mortem examination in a large percentage of cases failed to show any evidence of the disease. It seemed probable, therefore, that the reactions had been provoked by sensitivity to some other acid-fast organism, such as the bacillus of avian tuberculosis. Comparative tests with guinea pigs at Weybridge had given something of a lead, and consequently a comparative test using mammalian and avian tuberculins

was put under field trial with cattle. The double intradermal comparative test was gradually evolved. Ultimately, after a considerable amount of research, a purified protein derivative tuberculin (PPD) was developed and came into official use in April 1943. After extensive field trials it was established that one injection of PPD tuberculin was as effective as two, and, on consultation, the Agricultural Research Council was satisfied that on the scientific evidence before it the single test should replace the double. This was a great practical advantage because only two visits were needed; a saving in labour 'both for the farmer and the veterinary surgeon without loss of accuracy'. It is probably, therefore, a fair deduction that the extra time gained for research into tuberculin and the techniques of its use, made possible by the enforced limitation of the Attested Herds Scheme during the war, hastened the ultimate attestation of all the herds in the country.

To return to the early years of the war: it was obviously essential to reduce avoidable losses of milk. To this end a scheme, properly known as 'A Scheme for the Control of Diseases of Dairy Cattle' but commonly referred to as the Panel Scheme or the Survey Scheme, was sponsored jointly by the Ministry, the National Farmers' Unions and the National Veterinary Medical Association in June 1942. Under the terms of the scheme a veterinary surgeon undertook to visit a farmer quarterly and advise him on the control of mastitis, Johne's disease, contagious abortion and infertility in his herd, and to make as many more visits as necessary for the treatment of sterile cattle or the diagnosis of doubtful pregnancies. The Ministry provided a free laboratory diagnostic service, and supplied abortion vaccine without charge, and sulphanilamide, for the treatment of mastitis, at a reduced price. By the end of the war there were nearly 7,000 herds in the scheme, involving more than a quarter of a million head of cattle. Although this scheme had its limitations it was of unique importance in establishing and fostering the idea of the approach to veterinary medicine on a herd basis. It may therefore be claimed as the first official recognition of this concept and, as such, as initiating preventive medicine on a herd or flock basis which has since developed and flourished. Although the present-day veterinary student has, of necessity, to study disease in the individual animal, he is being taught to think more and more in terms of preventive medicine.

A second war-time voluntary measure, the 'Calfhood Vaccination Scheme' against contagious abortion, was introduced in December 1944. It owed its inception to the evolution of Strain 19 *Brucella abortus* vaccine which had proved very effective in preventing abortion storms in herds in the United States. The United States Bureau of Animal Industry acted most generously by seconding to this country, for several months in 1942, an expert in the preparation of this specialised vaccine. There is abundant evidence that the use of this vaccine had, and is still having, a very marked beneficial effect on the number of viable calves born, on the milk production of the

dam, and on the prevention of sterility due to secondary infections of the uterus that so frequently occur if the placenta is retained. The scheme has since been modified and expanded.

Reference has been made to Section 24(1) of the Agriculture Act 1937, in which the Minister agreed to give support to responsible breeders and distributors of poultry stock. To ensure the continuance of these approved flocks during the war, extra food was provided for them under the Preferential Feedingstuffs Scheme subject, however, to blood tests being carried out in order to ascertain whether the flocks were sufficiently free from bacillary white diarrhoea (pullorum disease) to warrant the County War Agricultural Executive Committee approving them for supplementary rations. These flocks were mostly accepted under a new scheme in 1945, the Accredited Poultry Breeding Stations Scheme for England and Wales, and under a corresponding scheme for Scotland. The blood testing was originally carried out at Weybridge and at Edinburgh. In 1942 a new rapid field test was evolved, initially carried out by WTVOS but latterly by a new grade of employee, the lay poultry tester. This grade, introduced in 1945, was at first restricted to women but after the war was opened to men. Gradually the range of field duties falling to the lay poultry testers expanded until in 1954 they were re-designated 'technical assistants'.

From these brief references to official schemes it will be appreciated that the intentions of the 1937 Act were, as far as circumstances permitted, carried out during the war.

The Attested Herds Scheme was re-opened to all types of herds on 30 June 1944 but without any financial assistance towards the cost of the qualifying tests and without any bonus payments. From 1 October 1943, however, a premium of 4*d.* a gallon had been paid to producers of TT milk and it was this financial stimulus which was effective. The number of attested herds steadily increased from then on.

The memory of the introduction of rabies after the First World War kept the Animal Health Division very much on the alert for irregular landings of dogs and cats by troops returning from the various war zones. There had, in fact, at the Dunkirk period, been an influx of various pets accompanying the returning troops; many dogs were detained and put into quarantine kennels, but others either died or were destroyed. A few must have got through undetected during that period; fortunately none developed rabies. From 1942 onwards, irregular landings of animals by members of the services became prevalent, but over the period 1942-47 only twenty dogs and one cat remained untraced. In order as far as possible to encourage the declaration of their pets a special quarantine station was established for the Services at Chilbolton in Hampshire. Four dogs developed rabies whilst in these kennels, fully justifying these special arrangements.

It will be remembered that in 1921 the recommendations of the Advisory

Committee appointed by the Development Commissioners to report on veterinary education and research became lost in the growing financial and political troubles of the twenties. They were re-discovered in 1936 and considered in great detail by a committee appointed under the chairmanship of Dr Thomas Loveday. The Committee reported its findings in July 1938 but, before its recommendations could be implemented, war broke out and a further delay occurred. Then, in a letter to the chairman dated 13 January 1943, the Minister of Agriculture, R. S. Hudson, said:

... the Government has announced its intention of maintaining after the war a healthy and well-balanced agriculture as an essential and permanent feature of national policy. The need of adequate attention for maintaining the health of our livestock, particularly our dairy herds, has become more widely recognised. We are satisfied, therefore, that in the changed circumstances not only is a better and in fact the best possible training for the veterinarians of the future of vital importance to agriculture, but also numbers substantially greater than exist at present or have hitherto been envisaged will be required for the efficiency and well-being of the livestock branch of the industry.

The Minister concluded by asking Dr Loveday if he and his Committee could meet again and see whether, in the light of present circumstances, they could assure the Secretary of State for Scotland and himself that they were following the right lines to produce the desired result.

Dr Loveday, when reporting in February 1944 the result of subsequent deliberations of the Committee, said that it had based its recommendations on the assumption 'that agriculture . . . will not be allowed to fall back into the state of uncertainty and depression which progressively prevailed between 1920 and 1939'. The Committee's main conclusion was that the existing one-portal system of entry into the veterinary profession should be altered and that each veterinary college should become integrated with a university and that a qualification bestowed by such a university should be accepted by the Royal College of Veterinary Surgeons as a registrable degree, with the proviso that certain safeguards as to standards of education in veterinary subjects should be ensured. It should be noted that at that time the RCVS conducted its own examinations through a panel of examiners who visited the various veterinary colleges in England, Scotland and Ireland.

The Committee was also convinced 'that the evil of unqualified practice' was a growing one and that an enquiry into this was a matter of urgency. The Minister of Agriculture, Tom Williams, appointed a special committee under the chairmanship of J. R. Chancellor to enquire into unqualified practice and, in 1945, it recommended that such practice should cease, provided that the rights of those who had earned their livelihood in this way for at least seven out of the previous ten years were preserved. This led eventually to the compilation of a supplementary register of the Royal

College of Veterinary Surgeons which listed the selected candidates who became known as 'veterinary practitioners'. A further committee was set up under A. J. Champion to investigate the position of employees of animal welfare societies. The Committee recommended that such employees should be licensed to do limited veterinary work, strictly for the societies concerned, and this was legislated for under Section 7 of the 1948 Act. The Ministry had been very active in assisting the enquiries of these two committees and, with the ultimate passing into law of the various provisions in the Veterinary Surgeons Act 1948, a reasonable solution of this thorny problem appears to have been found. The main recommendation concerning transfer of the responsibility for veterinary education to universities has been fully implemented, including the establishment of two new university schools at Cambridge and Bristol and agreement for recognition of the degrees of the two Irish schools.

It has already been noted that three veterinary advisory officers had been appointed and centred on Cardiff, Newcastle and Bangor. This was the beginning of the Veterinary Investigation Service; at present there are nineteen laboratories in England and Wales which are designated veterinary investigation centres, each being in charge of a veterinary investigation officer (VIO) with one or more assistant VIOs, who now include officers with special training in bovine infertility and associated problems. The Veterinary Investigation Service was taken over by the Ministry in the autumn of 1946 and forms a link between Weybridge and the field staffs of the Animal Health Division. Three centres are now located in close proximity to the veterinary schools of the universities of Liverpool, Bristol and Cambridge. This permits collaboration between the staffs of the schools and the centres to their mutual benefit and, even more important, it facilitates the teaching and understanding of preventive veterinary medicine. The University of Cambridge has recognised the teaching value of the VIO and two of his staff by electing them MA by special statute, with all the privileges of MA status within the University. All in all, the Veterinary Investigation Service forms a most important link in the Ministry's work of developing preventive medicine throughout the whole country.

During the last two years of Sir Daniel Cabot's term of office there were two especially troublesome problems. First, in December 1946 a wave of a particularly diffusible form of foot-and-mouth disease swept over Europe and reached this country, apparently through the agency of migratory birds, leading to the slaughter of more animals than in any year since before the war with the solitary exception of 1943. Further outbreaks, through the medium of swill, continued to add to the losses. Secondly, and much more ominous, an outbreak of fowl pest (Newcastle disease) was confirmed in Somerset in February 1947, which subsequent investigation showed to have been introduced into this country in the carcasses of table poultry imported from Europe. The incidence of the disease rose rapidly until by the end of the year 2,222 outbreaks had been

confirmed, most of them the highly virulent peracute form of the disease. Although a slaughter policy with all the usual accompaniments, including movement control, succeeded in eliminating the peracute form of the disease, fowl pest was to remain a most serious and intractable problem. Both the acute and subacute forms of the disease persisted in spite of continued comparative freedom in several parts of the country until, in 1963, following the deliberations of a departmental committee under Sir Arnold Plant, the slaughter policy was abandoned except in Scotland.

On Sir Daniel Cabot's retirement, Thomas Dalling, who was Director of the Laboratory at Weybridge, became also the Chief Veterinary Officer in August 1948. He held both appointments concurrently until 1950.

In 1948 the last case of parasitic mange of the horse was recorded. There had been a more or less steady decline in the incidence of this condition since the Parasitic Mange Order of 1911. As no outbreaks were recorded in 1949-50-51 the disease was officially added to the list of those notifiable diseases which have been eradicated from Great Britain.

In 1949 certain aspects of the traffic in horses for export to the Continent gave rise to some public anxiety and the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, with the concurrence of the Secretary of State for the Home Department, the Minister of Health and the Minister of Food, appointed a departmental committee under the chairmanship of the Earl of Rosebery to enquire into

1. the extent of the export trade in horses for (a) work and (b) slaughter, and the considerations affecting the continuance of the trade for either purpose;
2. the extent of the practice of slaughtering horses for food for human and animal consumption in this country; and the considerations affecting the continuance of the practice;
3. the effect of the export and slaughter of horses on the supply of working horses in this country;
4. the desirability or otherwise of encouraging the breeding of horses for slaughter;
5. the statutory provisions designed to prevent unnecessary suffering by horses while being transported by air, rail or sea and in the slaughterhouses; whether such provisions are adequate and whether they are properly enforced.

The Committee, when reporting at the end of the year, expressed the view that as there was no evidence of any real demand for British horses for work on the Continent it was obvious that they must be required for slaughter, and that if the export trade in horses were resumed it would be solely for the benefit of the butchering trade. In order to try to stop this, the Committee recommended that substantial increases should be made in the minimum values prescribed in the Exportation of Horses Act 1937, below which export to Europe was prohibited. To implement this recommendation the Exportation of Horses (Minimum Values) Order 1950 was made and came

into operation on 1 May that year. The minimum value for a heavy draught horse was raised to £80, a vanner or mule to £75 and an ass to £10. The effect of this Order on the export of horses to Belgium was dramatic, the numbers dropping from 2,488 in 1949 to only 52 in 1950 and to a mere 28 in 1951.

The Committee, generally speaking, did not find anything 'radically unsatisfactory' in the transport of horses by rail or road, but it was of the opinion that existing regulations should be amended to provide for the feeding and watering of horses in transit at intervals of not more than twelve hours. The transport of horses by road was a new business which had started after the war and so these animals were not protected under the Transit of Animals (Amendment) Order of 1931. This omission was rectified in the Transit of Horses Order 1951.

A sequel to the Rosebery Committee was the appointment by the Minister of Food in 1952 of the Committee of Inquiry into the Slaughter of Horses, under the chairmanship of the Duke of Northumberland,

to consider the law and the practice thereunder relating to the slaughter of horses in slaughterhouses and knackers' yards and to recommend whether any further safeguards should be introduced to ensure the humane slaughtering of horses in this country.

In August 1953 the Committee presented its Report, which concluded that the risk of cruelty was not so much in the method and act of slaughter as in treatment of horses awaiting slaughter. Its recommendations, which were primarily designed to secure improved standards in all slaughterhouses and knackers' yards, were incorporated into the Slaughter of Animals (Amendment) Act 1954.

Until 1950 the legislation governing practically the whole of the work carried out in the control of animal diseases was based on the Diseases of Animals Act 1894, and its five amendments in the years 1896, 1903, 1910, 1927 and 1935. All this legislation was now revoked and replaced by the Diseases of Animals Act 1950 which was given the omnibus rôle of consolidating all the previous legislation contained in the earlier Acts, as well as incorporating portions of a number of other related enactments. All subsequent Orders and regulations in connection with the eradication of bovine tuberculosis were empowered by the 1950 Act, including the Tuberculosis (Area Eradication) Order, the Tuberculosis (Slaughter of Reactors) Order and the Tuberculosis (Compensation) Order which had been envisaged under the provisions of the relevant sections of the Agriculture Act 1937.

By October 1950 it was estimated that 20 per cent of all cattle in Great Britain were in attested herds. It was decided, therefore, to eliminate the infection gradually in selected areas throughout the country, starting where voluntary progress had already been made. This was known as the Area Eradication Plan, the legislation governing which, as has just been seen, was authorised in the 1950 Act. The first attested areas thus

formed were all small island groups. All the herds in the Scilly Isles, Shetland, the Isle of Arran and the islands of Great and Little Cumbrae in the County of Bute achieved attested status without the need for free-testing and subsequent processes. These groups were declared attested areas in February 1951. Voluntary attestation had by this time made good progress in south-west Wales and in south-west Scotland. With few exceptions the remaining farmers in these areas took advantage of the free testing facilities and on 1 April 1953 these parts of Wales and Scotland were declared attested areas. The first part of England to become attested was in the north-west in October 1955, whilst the Welsh and Scottish areas were further expanded. From this time onwards the pace quickened and at no time was momentum lost. During the year 1959 Scotland and Wales became attested areas and in Great Britain as a whole 95 per cent of all cattle had reached attested status. By October 1960 the whole country was a single attested area: a result which was obtained within the space of ten years from the initiation of the Area Eradication Plan.

It will be remembered that in 1942 the so-called Panel Scheme was initiated in order to try to reduce the losses due to diseases of dairy cattle by encouraging closer co-operation between farmers and veterinary surgeons on these problems. During the succeeding eight years considerable advances had been made in this field and, as far as possible, had been applied. It was generally felt, however, that the Panel Scheme had served its purpose and that no further undertakings should be accepted after 30 September 1950. The Ministry, in announcing this decision, emphasised the importance which it placed on preventive medicine in the herd and expressed the hope that individual farmers would discuss with their own veterinary surgeons the possibility of some contractual arrangement whereby a regular quarterly visit would be made to examine and discuss the overall health position of the herd. This re-orientation of outlook on the health of our herds and flocks which had taken place since 1942 can fairly be attributed in no small measure to those who initiated and supported the Panel Scheme during the war years.

There had been a progressive increase in the recorded outbreaks of anthrax from 244 in 1949 to 407 in 1951. In 1952 the number of outbreaks suddenly soared to 1,215 and they had, moreover, rather an unusual feature in that almost half of them occurred in pigs. The main suspicion fell on bones and bone products but, as always in anthrax, it proved almost impossible to trace with certainty the real origin of the highly resistant spores. Fortunately, by the end of the year, the monthly figures began to improve, dropping to 609 cases in 1953 and to 350 the following year. Generally speaking it can be said that it is most difficult to prevent the introduction of contaminated food material and bone meal imported from countries where this disease is endemic. What can be done in this country to lessen the spread is to prevent the illegal spilling of blood from anthrax carcasses—a procedure that leads to the formation and distribution of immense

numbers of the highly resistant spores. The Chief Veterinary Officer in 1955 felt constrained to report 'A disturbing feature in connection with anthrax continues to be the large proportion (about 15 per cent) of cases where the carcasses are cut and blood shed'.

J. N. Ritchie succeeded Sir Thomas Dalling as Chief Veterinary Officer in March 1952, and was greeted by the news that foot-and-mouth disease had begun to show signs of serious spread. There was, in fact, a rapid increase in outbreaks for the next two months and after that a steady fall to what was described as 'a clean sheet' at the end of the year. Inevitably, however, as had happened after other major outbreaks of this disease, a considerable amount of criticism was levelled at the Ministry on the effectiveness or otherwise of its method of control. The Minister, Sir Thomas Dugdale, decided that the time had come for an impartial review of the policy for controlling foot-and-mouth disease and in September 1952 he appointed a departmental committee under the chairmanship of Sir Ernest Gowers. The Committee, after nearly two years' intensive study of the problem both at home and abroad, published its report in July 1954. The findings not only supported unequivocally the existing policy of slaughter of all affected and in-contact herds but also the general procedures employed by the Ministry in connection with outbreaks. The Committee alluded specifically to the manner in which the veterinary staff had carried out its duties when dealing with the 1951-52 outbreak, stating that the officers concerned had worked with zeal and efficiency deserving of the highest praise. The Report stressed the necessity for the utmost vigilance in the observance of the various disease prevention measures, particularly those relating to imported meat products and to the effective boiling of pig swill which might contain infected meat or bone scraps. Probably the most important recommendation was that the salvage of meat from apparently healthy animals on infected premises, a survival of a war-time exigency measure, should cease. The Committee appreciated to the full that foot-and-mouth disease was essentially an international problem and one which, in the long run, only international action could resolve. In fact, following an international meeting attended by thirteen countries held in Copenhagen and organised by FAO, discussions were set afoot and eventually the European Commission for the Control of Foot-and-Mouth Disease was set up with six founder members. It meets each year in Rome and there are now sixteen member countries. Sir John Ritchie is currently the Chairman of the Commission. It has undoubtedly made a considerable contribution in reducing the number of outbreaks in western Europe and consequently in Great Britain.

When foot-and-mouth disease is prevalent in western Europe the chances of the infection reaching Great Britain are always increased. Even so, the main source of the virus still appears to be South America. In recent years an extensive vaccination programme in Argentina has brought about a considerable degree of control over the

disease as far as cattle are concerned; the same does not apply to pigs because suitable vaccines for these animals have not been developed and little attention has been paid to the disease among pigs in South American countries. Because of the continuing risk of introduction of disease with pork products their importation from South American countries was prohibited as from February 1961, when it became unlawful to import pork, pork offal, and bacon and ham unless fully cured. In that year, before the ban could become fully effective, ten out of eighteen primary outbreaks were attributed to imported meat or bones of South American origin; the origin in the other eight was not traced. It is significant that since the banning of pig products became effective the number of primary outbreaks has been remarkably reduced. This action is one of the few amendments of the Bledisloe agreement. In South America, as elsewhere, systematic vaccination schemes are bringing foot-and-mouth disease under control. At present the international outlook is perhaps brighter than it has ever been.

In the year 1953 no case of sheep scab was notified to the authorities and there had only been one outbreak in February of the previous year. There was thus every reason to think that the long campaign against this parasitic disease had at last been successful. Although much credit must go to those officers in the field who had had the arduous duty over many years of enforcing the rather unpopular double-dipping of sheep, there can be but little doubt that single-dipping with a dip containing benzene hexachloride hastened the elimination of the scourge from its last strongholds in the hills of Wales, Derbyshire and Cumberland into which it had been driven.

In the report of the Royal Commission on Scottish Affairs, presented to Parliament in July 1954, was the recommendation that the responsibility for the administration in Scotland of the Diseases of Animals Act 1950, and other legislation dealing with animal health, should be transferred to the Secretary of State. The Government, in accepting this recommendation, made the qualification that for the reasons given in the Gowers Report, which had stressed the desirability of unified control in dealing with epidemic disease among animals, the responsibility for such control throughout Great Britain should remain with the Minister of Agriculture. An Order in Council entitled the Transfer of Functions (Animal Health) Order 1955, which came into operation on 1 August 1955, gave effect to this decision by re-distributing ministerial functions under the Diseases of Animals Act 1950, and Orders made under it. The broad effect of this was that the Minister and the Secretary of State became jointly responsible for all policy matters in relation to the control of notifiable diseases, principally foot-and-mouth disease, anthrax, swine fever and fowl pest. The Minister became solely responsible, throughout Great Britain, for the actual operational measures taken to deal with outbreaks as they occur. Full responsibility rested with each Minister in his own territory in regard to brucellosis melitensis, epizootic abortion, warble fly infestation and tuberculosis, of which only certain

forms of tuberculosis of cattle were notifiable. The Secretary of State thereby became responsible in Scotland for the Attested Herds Scheme, including bonus payments to herd owners. All policy matters in relation to the import of livestock and animal products became a joint responsibility. Administration was undertaken by the Ministry in England and Wales, and by the Department of Agriculture in Scotland, with the latter controlling the Scottish landing places for imported animals. Similarly, policy concerning the export of livestock was determined jointly, although the Ministry continued to maintain a central information bureau of import regulations of overseas countries as a common service. The Department of Agriculture for Scotland became responsible for the Glasgow export quarantine station. Regulations governing the transit of animals by land and sea, on both humanitarian and disease-control grounds, became the responsibility of the two Ministers acting jointly.

Policy in regard to a number of miscellaneous animal health matters contained in generally applicable regulations concerning such matters as the control of dogs, approval of disinfectants and sheep dips, boiling of animal foodstuffs, disinfection of markets, and supervision of quarantine premises for imported dogs and cats was determined by the two Ministers jointly, but responsibility for detailed administration in Scotland was transferred to the Secretary of State.

An important function remaining with the Minister was the appointment of veterinary staff, who in Scotland became available to the Secretary of State to provide the professional advice and services required in relation to the responsibilities transferred to him. It was very necessary that an integrated veterinary service should be maintained on a Great Britain basis so that the Minister and the Secretary of State shared a common source of veterinary advice, having at their disposal a highly mobile and experienced professional staff which was available to deal with particular outbreaks of disease anywhere in Great Britain. The senior veterinary officer in Edinburgh was a deputy chief veterinary officer and the headquarters staff was augmented to provide the advice and services required by the Secretary of State.

As the only veterinary laboratory of the Ministry located in Scotland, at Lasswade, was a sub-station of the Weybridge Laboratory, and as the services provided by the laboratories played such an important part in the operational control of epidemic diseases, it was decided that the Lasswade Laboratory should remain under the control of the Minister.

It is clear, then, that the closest possible collaboration between the Ministry and the Department of Agriculture for Scotland was necessary on all animal health matters. Once again a delicate transfer and re-adjustment of responsibilities took place smoothly and without difficulty.

The welfare of animals in transit, whether on sea or land, has been a continuing care of the Government veterinary services from 1870 onwards. Members of the

public are ever on the alert to detect anything that might possibly be construed as 'unnecessary suffering' in any animal. When, for example, in 1957 some apprehension had been expressed about the possible cruelty that might result from the export of cattle to the continent of Europe, the Minister was quick to appoint a committee under the chairmanship of Lord Balfour of Burleigh to investigate. It caused no surprise when the Committee reported that it 'regarded the existing regulations governing the transport of animals in Britain as really comprehensive and perhaps a model of their kind'. It also commented favourably on the Exported Cattle Protection Order. The Committee was nevertheless concerned by evidence that cattle, many of them old cows, were sometimes sent long journeys after arrival on the Continent, where the protective legislation of Great Britain did not necessarily have its counterpart. It therefore recommended that this trade should be allowed solely to small countries or territories where internal transit would only involve short journeys and where firstly the Governments concerned would give assurances against re-export, secondly the methods of slaughter satisfied British requirements and, thirdly, the condition of lairage and slaughterhouse facilities were satisfactory. Certain difficulties arose over adopting some of the Committee's recommendations. However, a working party, set up by the Council of Western European Union, considered the detailed difficulties and put forward a compromise which, in its ultimate application, broadly conformed to the recommendations of the Balfour Committee.

In like manner, although the Horses (Sea Transport) Order of 1952 safeguarded the welfare of horses on sea voyages to and from Great Britain, there was some doubt whether it safeguarded ponies. The Ministry and the Department of Agriculture for Scotland therefore discussed with animal welfare organisations and pony breed societies other measures that might be adopted for the protection of these animals. To get first-hand knowledge, a senior veterinary inspector accompanied a consignment of ponies to Canada. While, generally speaking, he found that they travelled well, even in rough weather, he formed the opinion that there did seem a case for some improvements in certain directions, notably the number of ponies in a pen, the segregation of mares with foal at foot, the provision of experienced attendants and the dimming of lights at night. The Exported Ponies Protection Order 1958 and an amendment of the Horses (Sea Transport) Order were made following this report. Apart from the new statutory requirements, undertakings were given to animal welfare organisations that the following criteria would be observed in their application:

1. each mare and foal at foot would travel in a pen by themselves;
2. care would be taken to see that pens were not overcrowded and that their dimensions were appropriate to the size of the ponies put into them;

3. when pens were not permanent structures but were erected as required for each voyage, they would be inspected on each occasion;
4. first-aid kits should be available on ships carrying ponies.

In 1954 the Select Committee on Estimates presented a Report on the Regional Organisation of Government Departments which drew attention to the complex nature of the local organisation of the Ministry of Agriculture and Fisheries. It underlined that in effect there were a number of local organisations and that, as arrangements were so complicated, it seemed likely that there could be overlapping, inefficiency and waste. The Minister therefore appointed an independent committee under the chairmanship of Sir Arton Wilson

to review the provincial and local organisation of the Ministry of Agriculture and Fisheries . . . to consider generally whether the organisation is best adapted to secure efficient and economical performance of the functions of the Ministry . . . in particular, whether there is undue complexity, over-specialization or overlapping inside the organisation . . . or duplication and unnecessary interference with the work of Local Authorities.

The Committee was reminded that in view of the decision to amalgamate the Ministry of Agriculture and Fisheries with the Ministry of Food it should have regard also to the remaining similar organisations of the latter.

The Committee found that there was little or no evidence of duplication or interference with local authority functions and this again reflects the efficiency of the ground-work that preceded the establishment of the Animal Health Division in 1938—a point to which allusion has already been made.

The Committee heard a good deal of evidence and made many visits to various offices and came broadly to the conclusion that there certainly existed some dual control, with its inevitable divided loyalties, in the Ministry's local organisation. The Committee insisted that as a general principle

there must be clean lines of command, along which precise instructions, clearly affixing responsibilities, should flow from the centre to the furthest outstation. Ideally, no officer should be in doubt about the definition of his own responsibilities, or answerable for executive action to more than one superior.

These observations were, of course, made for the benefit of the multifarious activities of the Ministry's organisation.

Turning specifically to the veterinary service which is, of course, the only concern of this book, the Committee recorded:

Veterinary staffs have been working for the State since the nineteenth century and over the years have built up a tradition of service which commands wide respect. All our witnesses have testified to their high standards and efficiency and we share their opinion. Even so, the Ministry's

senior veterinary officers, the British Veterinary Association and the Institute of Professional Civil Servants have all drawn our attention to a number of existing problems.

The Committee found that the Animal Health Division was made up of two organisations¹: *The Inspectorate*, which was responsible for the prevention, control and eradication of animal diseases; and *The Investigation Service*, which performed local disease-control experiments and provided a routine diagnostic service for veterinary practitioners. The whole of this work required nearly 1,500 full-time staff, of whom one-third were veterinary staff, costing more than £1 million annually on salaries and wages alone and, in support of this permanent staff, there were over 1,700 fee-paid private practitioners, engaged on an *ad hoc* basis, who cost nearly another million a year.

Because of its close contacts with the Local Authorities and the police, the Veterinary Inspectorate is organised for the most part on a county basis and because epidemic diseases do not respect national boundaries it extends into Scotland. The traditional unit is the Animal Health 'division' which is generally one county but may be a group of counties. It is in charge of a Divisional Veterinary Officer (DVO) who reports to Headquarters for most of his day-to-day work. For purposes of co-ordination, however – particularly against outbreaks of epidemic diseases – divisions are grouped into twenty areas covering Great Britain (fifteen in England and Wales), each in charge of a Superintending Veterinary Officer (SVO). The area is based broadly on the amount of work which one SVO can conveniently handle and has no relationship with the areas covered by any of the other organisations of the Ministry.

The Veterinary Investigation Service is a regional organisation brought over to the Ministry in 1946 as part of the general transfer from the Universities of their scientific establishments and specialist consultant services for agriculture.

The investigation centres tended to cover the same areas as NAAS although, in fact, they usually appeared to cover a somewhat smaller region with an ill-defined periphery. Having discussed these facts the Committee recommended that:

'The present area organisation should be replaced by an organisation based on the standard MAFF regions and a Regional Veterinary Officer (RVO) appointed to take charge of all veterinary staff in the region. The Ministry's proposal to create two grades of Veterinary Officer is endorsed.'

Some time before the Arton Wilson Committee was appointed, the Ministry had drawn up proposals for changes in the veterinary inspectorate with the following objects in mind:

- (a) to reduce the abnormal length of the salary scale in the recruitment grade of veterinary officer (VO) by introducing a senior grade of VO to which promising officers could be promoted at an early stage;

¹ Dealing only with regional organisation the Committee was not concerned with the Ministry's veterinary laboratories.

- (b) to introduce two grades of DVOs and so make it possible to differentiate in favour of officers in charge of larger and more difficult divisions;
- (c) to increase the size of areas covered by the SVOs and so bring them into line with NAAS regions.

The Committee was asked to express an opinion on these proposals, not all of which had found favour with the Association of State Veterinary Officers. Bearing these and its own findings in mind, the Committee recommended:

- (1) The MAFF Divisions should be the basic unit of animal health organisation.
- (2) There should be two grades of DVO, one roughly equivalent to and the other slightly higher than the present Divisional Veterinary Officer level.
- (3) There should be a senior-grade DVO in charge of nearly all the MAFF Divisions, with lower grade DVOs in charge of the remaining grouped counties.

Although the Committee recognised that there was justification for full-time executive and clerical staff for animal health work, yet it felt convinced that

... county veterinary staffs should wherever possible be housed in the same premises as the Divisional Executive Office and should share all other common services. Similarly, the establishment of Divisional Executive Offices should permit of early devolution from Headquarters of the £2-£3 million capitation bonus paid under the Attested Herds Scheme. With the experience which has been gained in the administration of this scheme, we recommend that the Divisional Veterinary Officer should now authorise all routine payments, which should then be made by the Divisional Executive Office.

Finally the Committee recommended that all technical work on the Milk and Dairies Regulations should be the responsibility of the veterinary inspectorate, to which the necessary technical staff (the milk production officers of NAAS) should be transferred and work with the existing technical assistants of the Animal Health Division¹.

When the recommendations of the Arton Wilson Committee were implemented in 1958 the main organisation of the inspectorate was:

Headquarters	1 Chief Veterinary Officer (CVO)
	3 Deputy Chief Veterinary Officers (DCVOs)
	4 Regional Veterinary Officers (RVOs)
England	7 Regions each in charge of an RVO with a Deputy Regional Veterinary Officer in support. (A DRVO was not in fact appointed to the Northern Region until 1960.)
Wales	1 Region with an RVO and a DRVO

¹ Neither this recommendation nor the proposal to split the DVO grade were put into effect.

- Scotland
- 1 DCVO in charge at Headquarters, Edinburgh
 - 1 RVO stationed at Edinburgh
 - 3 Regions each in charge of an RVO with a DRVO in support.

The Laboratory and Investigation Service, under the Chief Veterinary Officer, had a Director and two Deputy Directors.

In 1963 the inspectorate of the Animal Health Division was re-designated 'Veterinary Field Services' and the senior DCVO, John Reid, was appointed the Director of Veterinary Field Services under the Chief Veterinary Officer, with two Deputy Directors at Headquarters and a third at the Scottish Office in Edinburgh¹.

Following a gradual increase in the incidence and cost of fowl pest there occurred in 1959 the worst outbreak so far experienced in this country. This reached its peak in December and was not brought under reasonable control until the following summer. Although the disease was generally of a much milder nature it was clear that, largely due to the intensive methods of poultry husbandry, the disease was becoming endemic. With mounting costs for compensation, and the continuing engagement of both veterinary and clerical staff involved in its control, it became obvious that changes in policy were needed. The Minister, Christopher Soames, therefore appointed a departmental committee on 19 July 1960,

to review the policy and arrangements for dealing with fowl pest in Great Britain and to advise whether any changes should be made in the light of the growth of the poultry industry, present scientific knowledge and technical administrative experience gained in recent years in this and other countries.

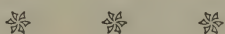
The Committee under the chairmanship of Sir Arnold Plant investigated the position in this country, interviewed many interested bodies and persons and, after visiting several foreign countries to study the situation and experience there, published its Report on 29 March 1962. As a result of its findings, and after discussions with representatives of the poultry industry, the Minister decided that the slaughter policy should be discontinued as from 31 March 1963, except in the case of outbreaks of peracute disease. An exception was also made in regard to Scotland where it was suggested the original slaughter policy with compensation should continue, experience in that country having shown that over the last decade there had been a lower incidence of disease than in the rest of Great Britain. Future control elsewhere was to be by the use of an inactivated (dead) vaccine which, when full supplies were available, the Ministry would provide for a limited period at a subsidised price in England and Wales.

It had been announced on 20 December 1960 that the Government had decided in principle to introduce a compulsory slaughter policy with compensation aimed at the eradication of swine fever from Great Britain. Owing, however, to the over-riding

¹ The present organisation is diagrammatically shown on page 342.

need for greater economy in Government expenditure in 1961-62 it was deemed necessary to delay this. The Minister was able, however, to announce in the House of Commons on 19 November 1962 that the new policy would come into operation on 11 March 1963.

In May 1962 a new Free Calf Vaccination Service with Strain 19 *Brucella abortus* vaccine was introduced for heifer calves between the ages of five and eight months. The purpose of this new service was to give further encouragement to the building up in the national herd of a high degree of protection against outbreaks of brucella abortion and thereby to reduce still further the losses caused by the disease. Whilst vaccination could not be guaranteed to be effective in every case, experience had shown that, when carried out in calves within the specified age range, protection could normally be expected for at least five pregnancies, and in the majority of animals the reaction to the blood agglutination test would have disappeared or have become insignificant by the time of first calving. There was little or no advantage to be gained from re-vaccination. Whatever the future policy was to be, therefore, it would not be prejudiced by calfhood vaccination, even if there were to be an eradication campaign depending on the blood agglutination test. Farmers using the new service must agree to have their calves permanently marked and give an undertaking not to have over-age animals vaccinated privately without official permission. While the response, so far, to this new scheme has not been wholehearted, adjustments have been made and it is to be hoped that, with the continuing avoidance of abortion storms in our herds, an 'out of sight, out of mind' attitude will not develop and vaccinations be allowed to lapse.



Veterinary science has travelled far since those early days of panic at the time of the cattle plague outbreak of 1865 when Dr Williams, the first Secretary appointed to the Veterinary Department of the Privy Council, complained that no 'machinery' existed for dealing with outbreaks of cattle plague or any other disease of livestock. The crude machinery that was set in motion then has been built up during the intervening hundred years into the Animal Health Division of the present day.

The basic elements have been developed and improved out of recognition, and the machinery has been responsible for the eradication of sheep-pox (1866), cattle plague (1877), bovine pleuro-pneumonia (1898), epizootic lymphangitis (1906), rabies (1922), glanders (1928), parasitic mange of horses, asses and mules (1948) and sheep scab (1952), whilst recently bovine tuberculosis has been virtually eliminated from Great Britain. Foot-and-mouth disease has been eradicated on every occasion on which it has appeared in this country, although this infection has persistently found devious and subtle ways to re-enter. These routes are sedulously closed as they are discovered.

Already the Animal Health Division is committed to dealing in one way or another with such remaining diseases as swine fever, anthrax, fowl pest, brucellosis and Johne's disease, but before methods of attack can be devised for certain other diseases, which at this juncture appear less clearly suited to control or eradication, much study, investigation and research are required, in which leading rôles must be played by the field, investigation and laboratory staffs of the State Veterinary Service.

The Administration

IT IS not absolutely clear how the early Acts of Parliament with which this story is concerned were administered but it seems that the machinery of the Privy Council was used.

Within seven years of its inception in 1865, the Veterinary Department was absorbing rather more than one-third of the total Estimate for the Privy Council. The Secretary was supported by a Chief Clerk.

The Department continued at much the same level until 1877, by which time its annual Estimate was exceeding that of the Privy Council. It was in this year that A. C. Cope was appointed Chief Inspector in succession to Sir G. T. Brown who had held the post since 1872. The Secretary was not replaced on his retirement; Sir G. T. Brown was appointed as Professional Officer and apparently became Head of the Department.

In 1883 the Veterinary Department of the Privy Council became the Agricultural Department of the Privy Council with an Estimate of £26,792 compared with £16,517 for the Privy Council itself. The senior officers in 1884 were: the Professional Officer, the Chief Clerk, the Chief Inspector, the Assistant Chief Inspector, two Senior Clerks, one Chief Travelling Inspector and three Travelling Inspectors. This pattern continued more or less unchanged until the Board of Agriculture was established in 1889.

Early records do not indicate clearly the professional qualifications of the various office-holders. It seems likely that laymen occupied a number of posts which today would be filled by veterinarians. Work, which at the present time would be regarded as proper to Animal Health Division as a unit, was divided into three sections. The business and correspondence connected with legislation were among the responsibilities of the Indoor or Chief Clerk's Branch of Animals Division; executive duties were carried out by the Outdoor or Inspection Branch, and there was a Chief Veterinary Officer who is recorded in 1896 as head of a Veterinary Department comprising fourteen veterinary inspectors. Because the total staff of the Board of Agriculture at this time, excluding messengers, fire-lighters and porters, numbered less than one hundred, liaison between the three sections was comparatively simple.

When the Board of Agriculture became the Board of Agriculture and Fisheries in

1903 there were thirty-nine inspectors and assistant inspectors in the Outdoor Branch, compared with ten in 1896. The Veterinary Department had doubled its whole-time strength of veterinary inspectors and was supported by 95 local veterinary inspectors. In 1920 the Diseases of Animals Branch of the new Ministry of Agriculture and Fisheries, which had absorbed the duties of the Veterinary Department and Animals Division, now employed 40 veterinary inspectors and 239 local veterinary inspectors. The Veterinary Laboratory, which had started in a back room in Whitehall Place in 1894, and had for a time been located at Alperton, was now in its new building at New Haw, Weybridge; it housed a total of 18 persons, including animal attendants.

In 1938 there was a major change when veterinary services of local authorities were transferred to the Minister by virtue of Clause 18 of the Agriculture Act of 1937. Enforcement of the early animal health legislation had been the responsibility of local authorities and, generally, this is still the case. Furthermore, under the early legislation local authorities were directly responsible for the control of animal disease in their areas. In order to discharge their duties, local authorities appointed veterinary inspectors whose main tasks were to enquire into reported cases of anthrax, foot-and-mouth disease, sheep scab, glanders, tuberculosis and parasitic mange, and to deal with certain of them; to provide veterinary inspectors at markets, and to examine and carry out tests on cattle as part of the public health duties laid upon local authorities by the Milk and Dairies Acts and Orders and the Milk (Special Designations) Orders. In 1937 local authorities employed about 220 whole-time and 700 part-time veterinary inspectors on this work.

While official measures of disease control, so far largely concerned with disease which spread rapidly, had enjoyed a fair degree of success, much less had been done with those other cattle diseases which spread more insidiously. This state of affairs was brought into prominence by the report of the Gowland Hopkins Committee on cattle diseases in 1934 and this has been recorded in the historical survey. The first Tuberculosis (Attested Herds) Scheme, made under the Milk Act of 1934, began in February 1935.

Gowland Hopkins had estimated an annual loss of about £3 million from tuberculosis alone, but this did not take account of losses of productivity. Tentative estimates made by the Ministry put the losses from livestock diseases of all kinds at about £14 million per annum, or some 10 per cent of the total output of the meat, poultry and dairying industries of the day. Clearly, there was an urgent need for a national programme for eradication of disease in farm animals. Accordingly, on 27 May 1937, the Minister of Agriculture made the following statement in the House of Commons:

The Government also propose to initiate a large-scale campaign for the eradication of animal diseases in Great Britain. Our object is to improve the health of our livestock and increase agricultural productivity by seeking to eliminate what is perhaps the worst of all forms of wastage and economic loss in agriculture. In the first instance, efforts will mainly be directed to

the eradication of disease among our cattle. The scheme will involve an additional charge on the Exchequer of about £600,000 per annum for the first four years. It will, however, involve centralization of public veterinary services and as against this increase the expenditure by local authorities will be reduced by about £170,000. Parliamentary authority will be required for these proposals; the Government are anxious, however, to lose no time in developing the existing scheme of control of disease and accordingly I am arranging at once to amend the Attested Herds Scheme by providing additional assistance in England and Wales as has already been done in Scotland to owners of dairy stock who are desirous of eradicating tuberculosis from their herds. This revised scheme will become operative on June 1st next.

The necessary legislation will be introduced to give effect to the aforementioned measures at the earliest possible moment and Parliament will be invited to pass it into law before the Summer Recess.

The necessary powers to give effect to these proposals were conferred by Part IV of the Agriculture Act 1937, which received the Royal Assent on 30 July that year.

It was to be expected that the proposals for a unified veterinary service under direct Government control would meet with some opposition in Parliament, for the Gowland Hopkins Committee had reported in favour of continued control through local authorities. However, in a minority report, Sir Merrik Burrell urged that the attack on animal diseases should be conducted on a national scale by a centrally organised staff. This was also the Government view. Unified veterinary control in a national service was generally accepted, though not without some opposition from Scottish members who, in arguing that there must be a separate veterinary service for Scotland, pointed to the efficiency with which the Scottish local authorities carried out their duties, and particularly to the fact that work under the Milk and Dairies legislation had been done in Scotland for a much longer period than in England and Wales. During the debate on the financial resolution the Secretary of State for Scotland assured the House that the Scottish part of the service would be under the control of a senior officer of the Ministry of Agriculture stationed in Scotland and in close daily touch with the various Scottish officials. On this assurance, an amendment requesting a separate Scottish service was withdrawn. When, however, the Bill was considered in Committee, there was a fresh amendment that the Secretary of State for Scotland should be brought into consultation with the Minister of Agriculture on all matters affecting the control of animal diseases in Scotland. This was strongly argued and carried to a division. While the debate was in progress, a foot-and-mouth disease outbreak occurred at Berwick-on-Tweed and resulted in the declaration of an infected area covering country on both sides of the border. This, although irrelevant to the point at issue, no doubt contributed to the defeat of the amendment. For the next eighteen years the Minister of Agriculture was solely responsible for animal health matters throughout Great Britain. In accordance with the undertaking given to Parliament by the Secretary of State an administrative branch was established in Edinburgh.

The Animal Health Division was organised to attack disease on a national basis and the administration was under the control of a Principal Assistant Secretary supported by three branches one of which, as has already been noted, was in Scotland. Of the other two, the first dealt largely with problems of the Diseases of Animals Act, including import and export matters, and the second with milk and dairies work, tuberculosis and disease eradication and control schemes.

It is appropriate here to refer to the many different places in which the headquarter administration of animal health matters has been located. In the early days it was at Storey's Gate. In 1877 it moved to 44 Parliament Street which had just been vacated by the Directors of Convict Prisons; this would seem to be the building now occupied by the Parliament Street Post Office. The administration remained at this address until 1891 when it was moved to Whitehall Place. It stayed there until, as the Animal Health Division, it moved in July 1939 to Soho Square. Because Animal Health Division was considered to be able to function equally well outside London it was evacuated in 1940 to Lytham St Anne's, Lancashire. The Chief Veterinary Officer, however, retained an office in London and, as might have been expected, there were regular journeys by senior staff between there and Lytham St Anne's. When the Division returned in November 1943 it was accommodated in the City at 99 Gresham Street. From there it moved in 1948 to 28-32 Chester Terrace, Regent's Park, and in 1950 to its present offices at Hook Rise South, Tolworth, Surrey.

In 1950 the various Diseases of Animals Acts from 1894 and certain other enactments relating to animal health were consolidated into the Diseases of Animals Act 1950 upon which current controls are based. This Act gives very wide authority to control diseases of animals and poultry and enables the definitions of 'disease', 'animals' and 'poultry' to be extended as circumstances dictate.

In 1954 the Report of the Royal Commission on Scottish Affairs advised that the Secretary of State for Scotland should assume the responsibilities of the Minister of Agriculture for animal health in Scotland. The Government accepted this recommendation subject to the qualification that the Minister should remain responsible for the control of epidemic diseases of animals throughout Great Britain, a point which had been stressed in the report of the Gowers Committee on foot-and-mouth disease. The change was made effective by the Transfer of Functions (Animal Health) Order, 1955. From this time the Secretary of State was directly advised by officials of the Department of Agriculture and Fisheries for Scotland and the branch of Animal Health Division in Edinburgh was replaced by an Animal Health Branch of the Scottish Department. The Chief Veterinary Officer, however, continued to advise both the Minister and the Secretary of State, and the veterinary staff remained under unified control throughout Great Britain.

As a result of the Transfer of Functions Order, and since policy for animal health

in Great Britain became the joint responsibility of the Minister and the Secretary of State, most Orders which are now made under the Diseases of Animals Act 1950 are signed by both Ministers, and the Animal Health Division maintains close liaison with the Department of Agriculture and Fisheries for Scotland on any developments which might lead to an Order. In the initial stages of making an Order under the Diseases of Animals Act where it is intended, for example, to permit the importation of carcase meat from a country whose products have hitherto been banned it is important that the Divisions and Departments dealing with meat supplies should have early warning so that they can assess the possible effect upon supplies and prices. Furthermore, the Divisions of the Ministry concerned with external affairs are also consulted so that they may be aware of proposals which may react upon international trading relations; they must decide whether there is a need to inform other Departments such as the Board of Trade or the Foreign Office. When all these matters have been decided, and Ministers have given their consent to the intended Order, detailed drafting instructions are sent to Legal Department whose responsibility it is to prepare the actual Order. Earlier consultation with Legal Department will have ensured that the proposed Order will not contain provisions which exceed powers granted under the Act or conflict with other legal instruments. The majority of Orders made under the Act are, however, concerned only with internal affairs. They usually impose duties on farmers or commercial interests connected with agriculture, and it is essential that the proposals should be fully explained and, if at all possible, agreed with them beforehand. In all cases it is most important that the enforcing authorities (generally local authorities for internal Orders and HM Customs for external Orders) are made aware of the existence of the new legislation and have its purposes explained to them.

This process of consultation cannot be carried out with Orders such as those establishing area restrictions on the movement of animals in connection with some of the notifiable diseases. The circumstances which make these Orders necessary usually build up very rapidly and the Division has authority to make such Orders without prior reference to Ministers.

With diseases of animals communicable to man the Health Departments must be kept informed and consulted about the action which it is proposed to take. There are several examples of this need for co-operation. The earliest measures dealing with bovine tuberculosis by the slaughter of animals showing clinical signs of the disease were essentially taken to protect public health; the requirement that imported dogs and cats must be placed in quarantine obviously protects man from the risk of rabies and these regulations, which are frequently criticised in this country, have always had the full support of the public health authorities. Conversely, their efforts to reduce the risk of anthrax to man through imported wool and other animal products have contributed to a reduction of the disease in animals.

It is the responsibility of the public health authorities to prevent the transmission of disease to man and occasionally this is not fully appreciated by the public, particularly in regard to milk. The risk of infection in milk is, of course, greatly reduced by the virtual eradication of bovine tuberculosis and by the better control of brucellosis and this has been the veterinary contribution. The public health authorities are, however, responsible for imposing the necessary restrictions on the use of infected milk either by prohibiting its use or by requiring pasteurisation of the supply.

In addition to the close liaison which Animal Health Division maintains with the Department of Agriculture and Fisheries for Scotland, it works in harmony with other governments in the British Isles, within which group of countries there is virtually free movement of animals. The Agricultural Departments involved are those of Jersey and Guernsey, Northern Ireland, the Irish Republic and the Isle of Man, all of which have their own separate animal health administrations.

The years following the Second World War saw an increase in the use of chemicals for the control of agricultural pests. These chemicals were rarely toxic only to the pests against which they were directed and their use gave rise to many problems, not the least of which was their potential danger to man. In order to keep abreast of developments, and following upon a number of official reports, the departments responsible for agriculture and health in Great Britain established in 1954 a voluntary scheme whereby manufacturers marketing new chemicals or recommending new uses for existing chemicals were invited to provide extensive data relating to their properties and their mode of action. The information provided is considered by a Government committee which, if it approves the chemical in question, issues recommendations for its safe use. The work of this Committee now extends to veterinary products which are considered by a veterinary sub-committee under the chairmanship of the Director of the Ministry's veterinary laboratories.

It should be appreciated that new discoveries influence not only the work of the technical side of the Division; they also shape the responsibilities of the administrators. An excellent example of this was the disclosure, following work done at Weybridge, of the association between deaths of poultry and a toxic substance produced in groundnuts and groundnut products. Because of the wide implications of this discovery long and detailed discussions were necessary with other Government Departments and, indeed, with authorities overseas. The outbreaks of poisoning with organic fluorine compounds at Smarden in Kent and at Merthyr Tydfil in Glamorgan are other good examples. In matters such as these the administrators, working particularly closely with their veterinary colleagues, must ensure that all appropriate Divisions of the Ministry and of other Government Departments and, if necessary, commercial interests, are brought fully into consultation. The work of the administration of the Animal Health Division will vary and extend as veterinary science expands its frontiers.

Developments in animal health policy are usually the outcome of discussions within the Departments and are subject to approval by Ministers. At some stage in the proceedings it is necessary to discuss the proposals with outside interests. These invariably include the National Farmers' Unions for England and Wales and for Scotland, with whom the Ministry and the Scottish Department have a close and continuing liaison. There are, however, occasions when the question under consideration is of such public importance that the Government decides that it should be looked at by an independent committee¹. Examples are the Gowers Committee on Foot-and-Mouth Disease, the Plant Committee on Fowl Pest and the Northumberland Committee on Veterinary Recruitment. When it is decided to set up such a committee dealing with animal health matters there are interdepartmental consultations on the membership and terms of reference. The necessary secretarial services are provided either by Animal Health Division or the Department of Agriculture and Fisheries for Scotland or both.

The Division maintains very close links with the veterinary profession through the Royal College of Veterinary Surgeons and the British Veterinary Association. Both bodies are regularly brought into discussion on many matters which affect the interests of the Government and of the profession. The Royal College is particularly concerned with legislation which governs the profession itself. Responsibility for this legislation is shared between the Agricultural Departments of the United Kingdom and the Privy Council. Changes in existing legislation, which may have been suggested by the Royal College, can require amendments to Orders made under the Veterinary Surgeons Acts, alterations to Royal Charters or major adjustments to the legislation itself. Agreement is reached between the Division and the Royal College and, where appropriate, the approval of the Privy Council is obtained. The proposals are then passed to the appropriate Legal Department and, if necessary, from there to Parliamentary Counsel for action.

The British Veterinary Association is concerned with changes in disease-control procedures because these will usually affect a large proportion of the profession either

¹ Committees are generally designated as Royal Commissions, Departmental Committees, Select Committees and Working Parties.

A Royal Commission is a body of persons appointed by the Crown to enquire into subjects of great public interest. Its members are people whom the appropriate Minister considers either to be experts in the particular field or widely experienced in public affairs. A Royal Commission reports to the Crown.

A Departmental or Interdepartmental Committee is appointed by the appropriate Minister or Ministers to investigate problems connected with the responsibility of the Department or Departments. This type of committee is more easily organised than a Royal Commission, and it has now replaced the latter excepting for what might be described as major investigations.

A Select Committee consists of Members of the House of Commons (or the House of Lords) chosen as representative of the parties and shades of opinion of the House. A Joint Select Committee consists of Members of both Houses. Each Session a number of Select Committees known as Sessional Committees are appointed to deal with matters arising during the course of a Session.

Working Parties or Study Groups are small groups or committees charged with the investigation of some particular problem or the preparation of some scheme. As the name implies, they are less formal in their proceedings than Royal Commissions or Departmental Committees.

in whole-time employment or as local veterinary inspectors. It is helpful to discuss the purely technical aspects of such problems with the Association so that agreement is reached on the practicability of the solutions put forward, and to ensure that these have the full support of the veterinary profession. The remuneration of local veterinary inspectors is also discussed with the British Veterinary Association.

Problems of animal health and animal welfare have always aroused a great deal of public interest both in Parliament and in the Press. It is not therefore surprising that a considerable part of the administrative activities are concerned with these aspects.

Parliamentary questions on various aspects of animal health or welfare are frequent, and material upon which the answers given by Ministers are based must be provided promptly and accurately. Often the limited time available between notice of the question and the date for answer results in a sharp race against the clock. Not infrequently animal health matters are discussed in Parliament either in connection with legislation or with adjournment debates or Private Members' motions. In all cases it is the duty of the Division and the Department of Agriculture and Fisheries for Scotland to provide all the background briefing needed to enable their Ministers to deal with any points that may arise during the debate.

Contacts with the Press are through the Information Division of the Ministry, and have three broad aims. Firstly, the Press is kept informed about the general development of disease controls and is provided with informed advice. This is done either by means of regular Press notices or by meetings with journalists on any particular problems currently of public interest. Secondly, any new Orders made under the Act are explained by issuing a Press notice with every Order published. Thirdly, there are occasions when journalists wish to check the facts behind some incident or story and seek an immediate reply. When this happens it is usually possible to verify the story with the veterinary field staff or with the veterinary investigation service so as to ensure that the information given to journalists is accurate. Besides the more formal contacts between Animal Health Division headquarters and the Press, veterinary staff in the field and at the investigation centres are not infrequently approached direct by journalists; this is particularly so during disease outbreaks.

An Assistant Secretary is in charge of Animal Health Division and there are Heads of Branches, each responsible to him for a particular section of the Division's work. Administrative and veterinary staff maintain close relations with each other at all levels and it is neither possible nor desirable to make too clear-cut a division of responsibility between them. Indeed, it is the healthy relationship that has been built up and maintained over the years and the respect which exists for each other's points of view that have largely been responsible for the successes achieved.

PART TWO

The Animal Health Responsibilities

Disease Control and Eradication

CATTLE PLAGUE

IT WAS the disastrous outbreak of cattle plague (rinderpest) in 1865 that precipitated the formation of the State Veterinary Service in Great Britain. Prior to that event there was a serious void in the Government machinery for there was no prescribed means for dealing with animal diseases and, even worse, there was virtually no appreciation of the need for such control. A shock was inevitable and the details of how it was absorbed have been related in the historical survey. There remains the intriguing question as to why it was not forestalled.

Rinderpest was no subtle disease. Its spread through a cattle population was blatant and devastating, and the majority of infected animals died. Experience had shown that it could only be controlled by radical measures and on three occasions in the eighteenth century it had been stamped out by a firmly applied policy of slaughter.

For many years thereafter Great Britain was protected from rinderpest by an insularity that was unbreached by cattle imports. After the ban on foreign cattle was lifted continued freedom was enjoyed because of a rigid veterinary control in eastern Europe that prevented the disease from spreading westward. It was these dimensions of time and distance that had made the country forget the ravages of rinderpest.

When the reminder came, the scene was very different from that in the eighteenth century. There had been revolutions, industrial and demographic, that had transformed the face of the country and its economy. Towns had developed, canals had been cut, railways were spreading and populations were changing.

In the County of London the population had more than doubled from 958,000 to 1,948,000 in the first four decades of the nineteenth century. Families were having to exist in one or two rooms apiece, in dwellings devoid of drains and chronically short of water. The babies were born into a world of squalor which even the dead could not entirely escape for there were too many of them and their bones overflowed the cemeteries.

To provide for the living, cows were cooped up in convenient buildings anywhere between the basement and the top storey where they were milked dry or became diseased. In either case they were then salvaged for meat in one of the many revolting establishments of butchers and tripe dressers.

In the absence of refrigeration and rapid transport the town dairy system was expedient but hardly efficient. It was particularly susceptible to the burden of contagious disease and, after the importation of foreign cattle was permitted, the town dairies and livestock markets became hotbeds of pleuro-pneumonia and foot-and-mouth disease. Dealers and importers flourished as the volume of the home and foreign trade increased, but it was a different story for the consumers. For them the price of meat rose although the quality of the product fell. A good deal of it was frankly unwholesome; even animals which had died or were stillborn were sometimes consumed, and butchers developed practices such as 'polishing' to dress up unattractive carcasses.

Free trade in cattle had meant free trade in cattle disease but the danger of that policy was still unheeded because neither foot-and-mouth disease nor pleuro-pneumonia produced losses that were dramatic in terms of spectacle or immediate cost. It took rinderpest to prove the point; and that experience was calamitous.

There was no excuse for it on the grounds of ignorance. For many years one man, Professor John Gamgee, had campaigned vigorously against the folly of ignoring animal diseases. He alone used factual evidence where others argued from flimsy premises or frank prejudice. His case was soundly based, for Gamgee was a man of talent and experience. He was born in Italy the second son of an English veterinary surgeon whose children all had exceptional intellectual ability developed by a sound education. Gamgee qualified as a veterinary surgeon in London in 1852 and spent the next three years on the Continent where the standard of veterinary medicine was undoubtedly higher. On his return to this country he started a drive for reform. The immediate aim was to improve veterinary education and he set a shining example by founding the New Edinburgh Veterinary College whereby a new generation of students had the benefit of his broad vision, which included the correct view of contagious disease. The profession at large was enlightened by his new monthly journal *The Edinburgh Veterinary Review*. One aspect of this illustrated Gamgee's foresight; the journal was used to publicise the statistics he derived from a nation-wide census of animal disease that would have done great credit to a government department had there been one. Another example of his planning was the First International Veterinary Congress which he convened in Hamburg in July 1863 to discuss the international problems created by epidemics of animal disease. Among the many delegates were professors of high academic status and other acknowledged experts who could speak with conviction backed by practical experience, for many European countries were fully aware of the cost of disease and maintained efficient veterinary services.

Gamgee was undoubtedly the authority on all aspects of disease control in Great Britain. He won some supporters but made many enemies and his proposals failed politically. In a report to the Privy Council in 1862 he urged reforms in the cattle

trade, the institution of markets for foreign stock and the development of a proper system of veterinary inspection throughout the country, but nothing came of it. In 1863 Edward Holland, the Member for Evesham and a staunch supporter of Gamgee, was obliged to withdraw his Contagious Diseases Prevention Bill. He did so on the understanding that the Government would promote similar legislation in the next session, but even that was killed. A clear warning to the country was given by Gamgee in two prophetic letters to *The Times*¹. They were remarkable for the accuracy of their prediction rather than the effects they achieved.

Gamgee failed. One can suppose that his task had been superhuman for there was no contemporary who could have resolved the problem as well as he had done. There was Professor James Simonds who was the putative specialist. He was consultant to the Royal Agricultural Society, and held the chair of cattle pathology at the Royal Veterinary College, but his opinions lacked inspiration. Neither was he particularly clear in his views on the cause of epidemic disease but he was not exceptional in this respect for there existed an utter confusion of explanations.

They embraced three main streams of thought. The pythogenic theory invoked a non-living, organic, toxic agent known as a miasma. This was believed to arise under mysterious circumstances from decaying matter and be carried on the air to the danger of susceptible animals who took it in. It excluded the possibility that one affected animal was a source of the disease for another. In contrast, the contagionist theory was based on the fact that disease was generated within the animal and that the morbid agent was then spread by direct or indirect contact to produce the epidemic. The germ theory was a refinement of the contagionist doctrine and postulated that the disease agent was living—a *contagium animatum*. Transcending all these concepts was the profound belief of ages that animal plagues were acts of divine punishment.

Gamgee was an early and ardent protagonist of the germ theory. He was conscious, too, of the importance to be attached to the latent period between infection and the manifestation of disease and, because of the obvious practical implications, incubation periods had been a topic of particular concern at the International Congress. Gamgee was also aware that there was no known cure or preventive inoculation for rinderpest.

The nation ignored the evidence but there was no delay in paying the price for the very first importation of cattle direct from eastern Europe brought rinderpest with it. On 29 May 1865 the SS *Tonning* docked at Hull with a cargo of oxen and sheep embarked at the Baltic port of Revel. The day before disembarkation one of the oxen was ailing. It was dosed with plenty of brandy, survived and subsequently reached the London market on 1 June. Whether or not it had rinderpest is a moot point. The only opinion on this was given by James Burchell. He had bought the cattle but was not familiar with the disease and diagnosed it in retrospect only after he had quarrelled

¹ See pages 13 and 14.

with Mr Hönck, the dealer who financed the importation, but it seems reasonable to conclude that the animals had been in contact with rinderpest prior to shipment. It had caused Burchell much embarrassment when the Russians forced him to buy some visibly diseased cattle: 'I had purchased them because they insisted upon my taking them. They stopped my passport and thought to frighten me very much. It is an awkward thing to be in a country like that, and to have your passport stopped, and you doing no harm.'

The visibly diseased animals were never loaded on the SS *Tonning* but the story had reached John Hönck. He took good care to consign the others to Lowestoft, and subsequently to telegraph the captain to make for Hull where he considered the port inspectors more lenient. No animals were detained and the consignment was dispersed to Manchester and London. The first cases of disease were encountered at Mrs Nicholl's dairy in Islington.¹ Thereafter there was chaos.

Gamgee the alarmist had been vindicated. It was he who then diagnosed the outbreak as rinderpest and the Revel cargo as the probable source of infection. The solution to the problem was eradication by slaughter and prohibition of stock movements but it was unacceptable to the country and earned for Gamgee and the enlightened members of the profession more ridicule than support. *The Times* editorials reveal the ignorance prevalent at that time of basic aspects of animal disease control. The public image of veterinary medicine was wrong. There were few who realised that slaughter was, far from being a policy of despair, an invaluable positive method of control. Because such a strategy was inconceivable in human epidemics it was irrationally condemned on the premise that veterinary medicine could not possibly do better than to follow human practice. The resulting insistent demand for a cure was a juggernaut that produced nothing but political confusion and spread of the disease. Newspapers and journals were full of 'certain cures'. Hardly a drug was left untried in some form or another, allopathic or homeopathic. Physical treatments were not neglected and one, reported to *The Times* by Dr Kidd, shows the lengths to which some owners were prepared to go:

The experience of a doctor in the treatment of the cattle plague in one of his own cows may interest some of your readers, especially those who have lost faith in the polaxe practice of the veterinary surgeon . . . In three hours, by the labour of four men, the cowshed was converted into a vapour bath by removing from the scullery the ordinary copper and cementing it on a furnace, which was extemporized with a few bricks, while three 4-inch stoneware drainpipes made a flue. Day and night the copper was kept boiling. In a few hours the atmosphere of the shed became warm and moist. Two men remained up all night giving phosphorous every two hours alternately with the arsenic. Towards morning the breathing became relieved. From 56 in the minute it fell in 12 hours to 40 (the next day to 32). On Friday we were in great hope, but on Saturday morning the cow calved, and the men thought her dying if not dead. Then I

¹ See page 16.

got them to pour down her throat four bottles of Barclay's stout in the course of eight hours. This the cow drank with infinite relish. To our surprise the calf was born alive. The poor cow seemed nearly dead, but, determined not to give her up, I ordered the gruel to be made with old ale, the bottled stout being also continued. Little by little she revived, and has gradually recovered.

By that same token of direct comparison with human practice, the success of vaccination was exalted as the supreme example of the prophylaxis that should be sought for rinderpest. Dr Murchison of the Middlesex Hospital went so far as to equate small-pox and rinderpest. Subsequent demand for small-pox vaccine caused so serious a shortage as to deprive human infants and create an open market for pedlars of croton oil.

In the face of this deep-seated antithesis to his proposals, Gamgee replied with commendable dignity in a letter to *The Times* on 12 October:

Sir,

I trust to your sense of fairness for the publication of the following remarks in reply to your leader on the cattle plague in this day's impression.

I may be possessed of a delusion, and it may be little satisfaction to the world at large that the highest authorities in Europe in veterinary matters are not more sane than I am as to the origin of the cattle plague in Great Britain. I must confess that this is some consolation to me, and when those who are better able to speak and to write than myself put the whole question on its proper basis, it is not improbable that you Sir, may acknowledge that there has been some method and reason in my madness. . . .

I can assure you, Sir, that my object is not to mislead, but, if possible, wisely and truthfully to direct public opinion on this subject. Permit me to ask, what can you, what can anyone suggest and prove as to the spontaneous origin of the cattle plague in these dominions? On my side I have the advantage of having predicted that the disease would reach us through the Baltic, because the Austrians and Prussians would preserve us so long as we had not direct importation, and in proof of this I have only to refer you to your own columns for 1863. The first cargo which came through the Baltic reached England only a fortnight before the steppe murrain was first seen in our market and we can now witness in this country, renowned for the beauty and the health of its stock, ravages of a character and extent unknown since the 'rinderpest' died out of Great Britain last century. . . .

In conclusion I beg to state that my only reason for opposing the attempts to cure the disease is to preserve the largest amount of stock from infection. If the public, if the stockowners wish their animals to be treated, and if our Government consider it right and proper not to make a vigorous attempt to exclude the plague from these islands, I, for one, am prepared to treat and record recoveries. I have no fear of a certain measure of success and as large a measure of success as other people, and perhaps while helping to save the lives of some scores or hundreds the country will learn that the horned stock of this land cannot on such a system increase and multiply.

I am, Sir, your obedient servant,

John Gamgee

Albert Veterinary College, Queen's-road, Bayswater,¹

London, Oct. 11

¹ The New Edinburgh College had been purchased by a London Company, re-named, and moved to this address in September 1865.

In contrast to Gamgee's positive policy the authorities tackled the disease in a desultory manner. As the number of cases multiplied, successive Orders in Council were issued. Each was as useless as the last and the virus continued to spread. The Orders failed for various reasons. In the first place the national problem was tackled on a parochial basis, power being vested in local authorities to act only if they thought fit to do so. Even if the recommended action were taken it had to rely for any success on a remarkable faith in human nature that in the event proved unrealistic. It put the onus on farmers to report disease in their herds, whereupon an inspector could slaughter, without compensation, the diseased animals. This naive approach caused many owners, for fear of indiscriminate slaughter, to conceal the disease or dispose of the herd before reporting it.

The inspectors and, in consequence, the veterinary profession came in for a lot of adverse criticism following the introduction of the slaughter policy. They were the sole arbiters of the diagnosis and thereby determined which animals had to be slaughtered. The delicacy of such a decision must have created, on some premises at least, situations that demanded much tact and tenacity. It was an invidious task. For any but a well-qualified man, it was an impossible one. It should be noted, therefore, that many inspectors who undertook it were not veterinary surgeons. The Orders had provided for 'other duly qualified persons' to serve and in this motley group came policemen, farriers, cow leeches, and at least one shoemaker.

By late September the disease was widely disseminated, assisted in the process by an expanding railway system which was offering unprecedented facilities for cattle transport. A report from Denny expressed the terror felt in Scotland:

The cattle plague continues to rage here with undiminished virulence. Since Tuesday last no fewer than 32 deaths have taken place in the district, while there cannot be less than 80 head of cattle at present affected with the pestilence. On Saturday there were 13 unburied carcasses lying in two fields at Dunipace toll-bar, some of which had lain since Thursday morning. The dilatoriness manifested in the burial of the dead animals is causing much comment, and there is no doubt that in one or two fresh cases which have been reported the disease has been contracted by the pestilential effluvia emanating from the carcasses after lying for three or four days above the ground. The two fields under notice, as may be supposed, presented a very melancholy sight on Saturday, the dead carcasses being scattered here and there, while fully thirty animals were staggering about in the last stage of the disorder. In two or three cases of the number dead, the struggle prior to death has, from the appearance of the ground, been terribly painful. One animal had thrown itself right on its back, and its horns were embedded to the root in the soil. The disastrous results of the plague are naturally causing great alarm in the district, and several holders of stock are slaughtering every animal in their possession, and selling the meat at 5½d. and 6d. a pound.

There was still more bad news to come. Simonds reported to the Privy Council that he had diagnosed rinderpest in sheep. A few days later, on 29 September, a Royal

Commission was appointed to investigate the origin, cure and prevention of the disease.

In eleven days, between 9 and 20 October, the Commissioners examined forty-five witnesses and received a deputation from the Lord Mayor of London. The First Report, ready by the last day of the month, was published on Saturday, 11 November. Its main purpose was to make recommendations for controlling the disease, but still no agreement could be reached.

A majority advised absolute prohibition of all cattle movement for a prescribed period. One minority group preferred to allow restricted movement under a system of permits. Another minority report, from one Commissioner, was in favour of no restrictions whatsoever. However, all did appear to agree that slaughter should be used only in exceptional cases and then with compensation.

Public opinion was similarly divided. *The Times* was at pains to point out that, although it was agreed the disease had been imported: '... the famous importation theory, in the specific shape which it assumed, has not been sustained by the evidence produced.' Very grudgingly, and with no redress for Gamgee, the same column announced that: '... The Commissioners do, in the main, adopt the views which have found most favour in our schools of veterinary science.' The *Daily Telegraph*, on the other hand, critically examined the evidence taken by the Commission:

We cannot understand how or why a body of commissioners, including a number of accomplished medical men, should have taken the opinion of non-professional persons as to the origin of the Rinderpest in this country, or to other points on which none but veterinarians of skill can speak with authority. Should we value what any number of non-medical men might say on the origin of diphtheria, typhus, or cholera? We consider it waste of time to listen to such witnesses as Mr JOHN GIBLETT. He was asked what he knew of the first manifestations of the disease, and he replied: 'I believe that there has been a baneful atmospheric influence. I do not at all believe in the reiterated statements of a few persons that it is an imported disease; on the contrary, I know that we have had diseases among cattle for a great number of years past; we have had the lung complaint; we have had what is termed the foot and mouth complaint; but in my humble view of the case the foot and mouth complaint is no complaint in itself – it is the result of a complaint in the animal; in a hide-bound animal, having fever, it cannot escape except through the hoof, or through the mouth and tongue.'

This gentleman may be able to talk about markets, and the purity of the foreign cattle which he imports; but surely we might have been spared the infliction of lessons in pathology from him or from Messrs. GIBBINS, HÖNCK, HICKS, GEBHARDT, and other cattle importers, who dogmatize so confidently on the origin of the plague in London, and contend that it was not imported. Against this evidence we have that of many competent professors and practitioners of the veterinary art; and it is to be regretted that much labour has been spent in vain by the Commissioners, and much valuable time lost, in prosecuting very useless inquiries amongst a class of people who knew nothing about the Rinderpest before it reached this Country, and have been very careful not to learn too much about it since.

These widespread differences of opinion inevitably led to further chaos. The legislation was tidied up with a Consolidated Order in Council dated 23 November, whereby the slaughter policy was dropped and hope placed instead in control of movements. The devolution of power to the local authorities resulted in a jumble of local regulations lacking central control. It was a failure, the measure of which was given by the fact that each succeeding period of four weeks saw the numbers of fresh cases almost doubled.

A Second Report by the Commission was issued on 5 February 1866. It added nothing useful by way of a solution. It repeated the necessity for stopping cattle movements and ingenuously concluded that: 'The present calamity has shown how defective are our general precautions—if any precautions can be said to exist—for the detection and prevention of Contagious Cattle diseases.'

A Third Report was yet to follow which recorded the findings of the several technical investigations commissioned the previous October. Although these added little to the useful knowledge of the disease, they provided a fine series of coloured plates illustrating the lesions. Of academic interest, however, was the first recorded evidence, by Dr Sanderson, that the blood of an animal in the incubative stage of a contagious disease teemed with infective particles as a result of multiplication from a small infective dose.

The Royal Commission had failed to advise the country on the best method of controlling rinderpest. Fortunately, by the time the Third Report appeared other influences had prevailed upon the Government.

By January 1866 the disease situation was alarming and public opinion was veering to the conclusion that drastic control measures were necessary after all. The Archbishop of Canterbury appealed for a Day of National Humiliation¹ and when it was rejected the Government was taunted in the House of Lords by the Earl of Carnarvon:

If indeed, Her Majesty's Government needed a reason for the view which they seem to have adopted, I could suggest a truer and more intelligible one: for I could understand their declining to appoint a day of fasting and humiliation on the ground that the Cattle Plague was likely to bring fasting enough and that we have already ample humiliation in the position which Her Majesty's Government have occupied during the last three months.

A firm political line was the only hope and on 12 February the Government introduced its Cattle Diseases Prevention Bill. That very same day Mr Hunt, the Member for Peterborough, also took action and sponsored the Cattle Plague Bill in the fear that the other one would be ineffectual. Both Bills proposed the reintroduction of slaughter for diseased animals, and this brought an appeal in verse and cartoon from *Punch* for an end to the party strife when facing cattle plague:

¹ See plate IV.

An Old Nursery Chime

(New Song from the Cattle Plague Debates)

AIR—"Jack and Jill"
 "Kill" and "kill", says either Bill:
 No cure's allowed but slaughter;
 GREY comes down
 Poleaxe on crown
 and HUNT comes axing arter.



THE POLITICAL COW-DOCTORS.

THE PATIENT. "OH, IF THEY'D ONLY LEAVE OFF QUARRELLING, AND JUST TRY 'UNITED ACTION,' IT MIGHT BE THE SAVING OF ME!"

This cartoon by Tenniel, the illustrator of *Alice in Wonderland*, portrays on the left the Prime Minister, Earl Russell, with Sir George Grey the Home Secretary, behind him. The Opposition is represented by G. Ward Hunt with Disraeli in the background. There was a political wrangle over a choice of legislative measures to deal with the cattle plague, neither side being prepared to sink party differences and unite in action which they all knew by then to be essential. Grey and Ward Hunt were the chief protagonists.

He was soon pleased to report that: 'Earl Grey, to whom *Punch* had privately shown our last Cartoon, the day before its publication, spoke exactly its counsel and recommended United Action, of course amid loud and general applause from Hereditary Wisdom.'

The Cattle Diseases Prevention Bill received the Royal Assent on 20 February. At last a firm line was adopted. It was virtually the one advocated several months previously by Gamgee. Slaughter of all diseased animals was obligatory, while those that were in contact with disease could be slaughtered at the discretion of the local authority. In all cases compensation was to be paid from the local rate. At the same time very severe restrictions were imposed on cattle movement and importation.

The disease was gradually mastered, although eradication was delayed by sporadic cases occurring in London and it was not until September 1867 that the country was entirely free from rinderpest.

The legislative control had proved effective and it makes strange reading many years later in Singer's *History of Medicine* to find it disregarded in favour of the theory that cattle plague had diminished according to Farr's Law!¹

The mortality due to the plague can only be an estimate, the chief reason being that there was no cattle census in those days. Earl Cathcart, addressing the Royal Agricultural Society, considered that 420,000 cattle had died in a population of 6,000,000. This gave a national average of 7 per cent, but in the worse-hit areas the proportion was obviously much higher. In Cheshire he put it between 50 and 66 per cent.

The country had paid dearly for the experience so it is not surprising that when rinderpest re-entered via Hull in 1872 and via London and Hull in 1877 there was no delay in applying the slaughter policy and both outbreaks involved a total of only 1,341 cattle.

Nowadays, one century after the cattle plague, even the name of the disease seems recondite. This is just as it was in June 1865.

FOOT-AND-MOUTH DISEASE

FOOT-AND-MOUTH DISEASE is caused by a filterable virus and is the most infectious disease known to veterinary medicine. All cloven-hoofed animals are susceptible. The disease is characterised by fever in the early stages and the development of vesicular lesions in the mouth, in the interdigital space and around the coronary band of the

¹ Farr's Law, in essence, states that in all epidemic diseases, after a rapid increase in incidence the rise gradually decreases until the maximum is reached, after which there is a rapid decline.

hooves and on the teats in females. The vesicles rupture in a matter of hours, producing raw areas in the mouth and on the teats and separation of the hooves around the coronary band. Except in very young animals the disease is seldom fatal, and its importance lies in loss of productivity resulting from the after-effects in recovered animals. These include loss of bodily condition, lameness resulting from secondary infection and from the shedding of hooves, abortion, loss of milk secretion, and mastitis which may lead to a permanent impairment of udder function.

These sequelae are variable in recovered animals, but experience in countries where the disease is endemic indicates that they are always damaging, often serious and sometimes even disastrous to the economy of a livestock enterprise. Because of the extreme nature of its infectivity the disease, if unchecked, will spread rapidly through cattle, sheep and pig populations, the virus being transmitted not only by animal to animal contact but also by intermediate agencies such as persons, vehicles and fodder, and by domestic pets, ground vermin and birds. It may even be wind-borne.

From time to time departmental committees have been appointed to review the methods for dealing with foot-and-mouth disease in Great Britain. Two have been outstanding for the value of their recommendations: the Pretyma Committee, which reported in February 1925, many of whose recommendations have formed the basis of procedure during the last forty years in applying the stamping-out policy; and the Gowers Committee which reported in July 1954 and emphasised that a policy of vaccination is not a valid alternative to stamping-out as a means of eradicating foot-and-mouth disease, and which recommended that, in this country, vaccination should be considered only in circumstances where eradication by stamping-out was no longer practical or economical. Both committees made special reference to the national economic importance of foot-and-mouth disease. The Pretyma Report stated: 'If once foot-and-mouth disease were allowed to become endemic the total loss which would be suffered by breeders and dairy farmers would be gigantic, and all stock owners would be faced with a constant and recurring menace, to say nothing of the effect on our export of pedigree stock.' The Gowers Report observed: 'Our evidence leaves us in no doubt on two points. One is that this disease would rapidly establish itself as endemic in any country that failed to take energetic and rigorous measures to prevent it. The other is that if it were to do so in this country the result would be a national calamity.'

Official records affirm that the first appearance of foot-and-mouth disease in Great Britain was at Stratford, near London, in August 1839. The first case in the veterinary literature of this country is recorded as occurring in the same month at Islington, London, and possibly refers to the same outbreak. It involved a very large dairy herd, numbering several hundred cows, and the case was recorded by Mr Hill, a veterinary surgeon of Islington Green, who was responsible for the veterinary supervision of the

herd. Hill was clearly an observant and painstaking clinician for he produced an accurate record of the symptoms and clinical pathology of foot-and-mouth disease. The disease was originally noted in six cows and Hill was inclined to attribute the illness to some toxic factor in the herbage of a field to which the animals had recently been moved. This opinion was supported by Mr Morton, a lecturer in pharmacy and materia medica at the Royal Veterinary College, who seems to have been called as a consultant. Within a week, however, the disease had spread to over 200 animals in the herd and its contagious nature was apparent. Over 500 animals are said to have been affected ultimately but none died. There is no evidence as to how the disease was introduced to this country. At that time the importation of susceptible animals was prohibited, but how effectively this was enforced is not clear. It is possible, of course, that infection was introduced from the Continent by indirect means. The disease spread rapidly; in September 1839 it was recognised in Smithfield market and before the end of the year it had extended to most districts of England and to some parts of Scotland.

During the next thirty years, until some measure of legislative control was introduced, the incidence of the disease, as would be expected, followed a pattern of severe epidemics succeeded by years of comparative freedom. Although accurate statistical records do not exist it is evident that the country suffered very severely from the disease in 1840-41 when 'the malady was more malignant than it has ever since been' according to a review of the disease in the Annual Report of 1871. Despite removal of the prohibition on import of foreign animals in July 1842, the years 1842, 1843 and 1844 saw a marked reduction in the incidence of the disease which, however, again spread widely during the latter part of 1845 and in 1846. There was a gradual fall in incidence from then until 1851 although cattle imports increased by five times during this period. A very severe epidemic occurred in 1852 and during the remainder of the decade the disease existed to a slight extent only. It was prevalent from 1861 to 1865, although less so than in many former years, and from then until 1869, largely coincidental with cattle plague movement restrictions, very few cases were experienced.

In 1869 there was an increase in incidence and a build-up during the next two years to the figure of 27,254 cases in 1870, which is the first year for which statistical records are available. In the following year the recorded outbreaks virtually doubled, totalling 52,164.

All through the early legislation and attempted legislation for the control of foot-and-mouth disease there is evidence of very great difficulty in persuading the community to accept the inconvenience of restrictive regulations in regard to a disease which did not cause high mortality. Although the first step in legislative control was made in 1869, an attempt had been made to introduce legislation in 1864. In that year the Cattle Diseases Prevention Bill, when referred to a select committee, had included

foot-and-mouth disease in the schedule of contagious or infectious diseases. The Committee, however, removed the reference to that disease, basing its decision on evidence given by representatives of farming interests in both England and Scotland who objected to its retention in the proposed legislation. It was, they considered, unnecessary and impracticable; severe restrictions placed on affected animals would result in immense financial loss to farmers and would lead to a considerable increase in the price of meat.

At last, however, in The Contagious Diseases (Animals) Act 1869, or in Orders of Council made under its authority, certain measures were enacted by which foot-and-mouth disease became notifiable, provision was made for prohibiting the movement of affected animals, local authorities were empowered to regulate movement of contact animals and to require disinfection of premises, and each local authority was required to appoint at least one inspector. This person, however, did not need to have veterinary qualifications and he had no power of entry to the premises even where he suspected disease to exist.

The intention of the Act concerning foreign animals was that they should be admitted freely unless their landing was specifically prohibited by Order of Council. Orders could also be made requiring imported animals to be quarantined or slaughtered as circumstances might require.

The powers of local authorities were permissive and the following significant sentence appears in the Report of the Veterinary Department of the Privy Council for the year 1872: 'Neither the provisions of the Act nor those of the Orders relating to foot-and-mouth disease appear to be enforced by the local authorities.'

In 1873 a select committee of the House of Commons, appointed to enquire into the Act of 1869, came to the conclusion that eradication or even substantial control of foot-and-mouth disease was impossible unless measures restricting movement and marketing of animals were adopted in the same way as for cattle plague, and that such measures would meet with strong opposition and be difficult, if not impossible, to carry out. The Committee therefore recommended that the Privy Council should cease to issue Orders for the control of the disease, that the disease should no longer be notifiable, but that prohibition of the exposure or carriage of affected animals should continue. These recommendations were brought into effect by an Order in Council dated 2 August 1873. The Royal Agricultural Society of England protested, however, and the following year the disease was again made notifiable and local authorities again authorised to make regulations prohibiting the movement of affected and contact animals.

In 1877 a further select committee considered the subject and its recommendations were incorporated in the Contagious Diseases (Animals) Act 1878 which took effect in October of that year. By this Act every local authority was required to employ

at least one veterinary inspector and as many others as the Privy Council might direct, and the inspector was given powers of entry to premises where he suspected the disease to exist. The disease was classed as notifiable and the local authority was empowered to declare infected premises, to carry out veterinary examinations and, when it considered the disease to exist, to recommend to the Privy Council the declaration of an infected area.

Provision was made in the Act of 1878 for the Privy Council to make Orders directing or authorising local authorities to slaughter and pay compensation in foot-and-mouth disease. The first was the Foot-and-Mouth Disease (Slaughter) Order of 1884 which also applied to contact animals but the slaughter had to be authorised by the Privy Council to whom, however, the owner had the right to appeal. In the following year a further Order permitted slaughter by local authorities, if they thought fit, without special authority of the Privy Council.

As might be expected, local authorities did not make very wide use of these powers since any local authority expending money to eliminate a centre of infection had no effective safeguard against re-infection from the district of a neighbouring authority which declined to adopt stamping-out measures. In 1884 Essex spent £34 in compensation for animals slaughtered on account of foot-and-mouth disease, Norfolk £263, Somerset £23, the Borough of Northampton £28 and Bedfordshire £10.

It was not until 1892 that provision was made for uniform action by the central authority. In 1890 an Act had been passed allowing compulsory slaughter by the Board of Agriculture of all cattle affected with pleuro-pneumonia and providing for the opening of the Cattle Pleuro-Pneumonia Fund at the Bank of England, maintained by an annual vote by Parliament.

The Contagious Diseases (Animals) Act 1892 enacted that powers exercisable, and money applicable, under the 1890 Act in cases of pleuro-pneumonia would have reference also to foot-and-mouth disease, and the term 'cattle' was extended to include all ruminating animals and swine. The amount of compensation in foot-and-mouth disease was prescribed as the value of the animal immediately before slaughter or, if affected with foot-and-mouth disease, the value before it was so affected, and this is in fact still the basis of compensation. Although permissive power continued until 1938¹ in Orders relating to foot-and-mouth disease to enable local authorities to slaughter with compensation the fact is that, since the introduction of the Act of 1892, the power to slaughter has been exercised only by the central authority save in exceptional circumstances as, for example, when the disease was confirmed in a herd of 120 pedigree cattle in Aberdeenshire on 18 November 1923. The Ministry decided not to slaughter this herd but to keep it in isolation. The local authority disagreed

¹ In 1938, by the authority of the Agriculture Act 1937, the Animal Health Division of the Ministry of Agriculture and Fisheries took over all veterinary duties which had previously been the responsibility of local authorities.

with this decision and more than eleven weeks later (in February 1924), after the animals had recovered, slaughtered the herd and paid compensation from the local rate.

The first case encountered after the passing of the Act of 1892 followed a period of five successive years of freedom from the disease. The case occurred in cattle in lairs at Islington market, the animals having been imported from Denmark. This led to Denmark being added to the list of countries from which imports were prohibited. The epidemic spread to eleven counties in England and four in Scotland with ninety-five outbreaks confirmed.

In the early stages of the epidemic, slaughter of affected and contact animals was carried out whenever it seemed that there was a likelihood of spread to other stock in the neighbourhood. As the disease became geographically more widespread the courage of those responsible for the policy faltered and for a period they resorted to isolation of affected herds. Later, however, the slaughter policy was re-introduced and the epidemic was brought under control. From then until 1921 slaughter of affected herds with payment of compensation became the rule, and during this period of twenty-nine years the yearly average was no more than fifteen outbreaks costing £600 each.

In 1922 a serious epidemic developed and it became clear that the amount of money available from the Cattle Pleuro-Pneumonia Fund would be speedily exhausted. In view, however, of the serious consequences to the livestock industry if foot-and-mouth disease should become firmly established in the country, Cabinet authority for additional expenditure was obtained. A gradual but effective reduction in the number of outbreaks indicated that success was being achieved in stamping out the disease. Unfortunately it was still doubtful whether eradication could be achieved within the limits of expenditure sanctioned by the Cabinet, and during 1922 the policy of isolating affected herds was again introduced for cases where it was considered that adequate safeguards could be established against spread of the disease. However, a very high incidence continued during 1923 and 1924 so that between 1 January 1922 and 31 March 1924 departmental expenditure on foot-and-mouth disease amounted to approximately £4 million and, as a result of the recommendation of the Pretymann Committee in 1925, expenditure on foot-and-mouth disease became a direct charge on the Treasury in 1929. In 1925 a considerable reduction in incidence of foot-and-mouth disease was experienced and the policy of isolation was abandoned in favour of compulsory slaughter of all affected herds, a policy which has been maintained to the present time.

In 1912 a small committee was appointed to carry out investigation into foot-and-mouth disease in India but, after only six months work, the project was abandoned as it was found that the indigenous cattle, sheep and pigs of that sub-continent had a

low level of susceptibility to the disease and were not, therefore, suitable for experimentation. In 1920 a further committee was appointed to conduct investigations into the disease, the work being carried out in an obsolete warship anchored off Harwich. This project was abandoned after about eight months, it having been realised that much more accommodation for animals was needed, and, in making its Report, the Committee recommended *inter alia* that any further research work on foot-and-mouth disease should be carried out on land. In March 1924, therefore, a scientific committee, subsequently known as the Foot-and-Mouth Disease Research Committee, was appointed 'to initiate, direct and conduct investigations into foot-and-mouth disease in this country and elsewhere, with a view to discovering means whereby the invasion of the disease may be rendered less harmful to agriculture'. The Committee acquired the existing cattle-testing station at Pirbright, Surrey, where it established an experimental centre now known as the Animal Virus Research Institute and which is the World Reference Laboratory for foot-and-mouth disease.

As already told, measures for a determined national attack on foot-and-mouth disease were introduced with the passing of the Contagious Diseases (Animals) Act in 1892. Since then legislative measures have been designed both towards preventing the introduction of the disease to this country and towards facilitating its eradication when it has occurred. Over the years, as veterinary knowledge of the disease and of its causative virus has increased, this legislation has been added to and amended. Legislative measures are such an essential feature of foot-and-mouth disease control that some of the circumstances which led to their introduction are worthy of description in some detail here. Others are dealt with elsewhere in this story.

The introduction of foot-and-mouth disease early in 1892 by the importation of cattle from Denmark led to prohibition of the landing of animals from that country in February of that year and to similar prohibition from twenty-five other countries before the end of that same year. In the Diseases of Animals Act of 1896 it was laid down that, save in exceptional circumstances, no animal could be landed from a foreign port except for immediate slaughter, and the central authority had power to prohibit the landing for slaughter from any country from which foot-and-mouth disease might be introduced. A similar practice has been continued to the present day.

During 1923 foot-and-mouth disease broke out among animals on board a ship bound from Montevideo for Antwerp and London. The animals were slaughtered and their carcasses, and the fittings used in connection with them, were thrown overboard. Among the general cargo aboard were animal feedingstuffs and, after unloading had started at London, the Ministry was unofficially informed of the circumstances which had transpired during the voyage. An Order was made detaining that part of the cargo intended for animal feeding, and requiring disinfection of the ship.

A safeguard against the possibility of infection being introduced in this way is now contained in the Animals (Importation) Order of 1930.

During the years 1903 to 1907 no case of foot-and-mouth disease occurred in Great Britain and there had been no case in Scotland for the previous fifteen years. In early February 1908 disease was confirmed in cows in a city dairy herd at Gorgie, Edinburgh. A consignment of hay which had been imported from Holland was believed to have been the source of infection in this case. The hay was fed to the cattle for the first time on 29 January. Four days later, on 2 February, one animal was noticed to be unwell and by 4 February over thirty animals in the herd showed unmistakable signs of foot-and-mouth disease. This incident led to the introduction of the Foreign Hay and Straw Order of 1908 which allowed the importation of these products for use as fodder and litter only from countries where a risk of the introduction of foot-and-mouth disease did not exist. The purport of this Order was continued in the Importation of Hay and Straw Order of 1955 and then in the Importation of Hay, Straw and Dried Grass Order of 1961 which is at present operative.

Following the serious outbreaks of 1922, 1923 and 1924, although recording that there was no strong evidence on which to implicate them as a source of infection, the Pretymen Committee made recommendations in reference to imported hay and straw used as packing material, and to certain articles packed in them. It also considered that packing and wrapping material used in connection with meat should be destroyed immediately after unpacking. As a result the Foot-and-Mouth Disease (Packing Materials) Order of 1925 was introduced. Its purpose is two-fold. Firstly it ensures that hay and straw used as packing material will not be brought into contact with animals, and that horticultural products packed in hay or straw will not be stored or offered for sale on premises where animals are being sold. Secondly, it requires that any cloth or other material used in connection with the wrapping of meat or offal shall be kept from contact with animals until it has been boiled or otherwise sterilised and any box or basket which has been used to carry meat must be kept from contact with animals.

A further step to minimise the danger of infection associated with imported meat was the introduction of the Importation of Meat, etc. (Wrapping Materials) Order of 1932. This Order, which is still operative, requires that meat or offal authorised to be landed in this country must be wrapped in certain specifically described material. No feedingstuffs or fertilisers may be landed in this country if they are packed in bags or sacks made from the material described as required to be used for wrapping of imported meat, nor may feedingstuffs, bedding or fertilisers be carried, packed or offered for sale in such material.

During the summer of 1926, while investigations were being made into the source of infection in outbreaks of foot-and-mouth disease in Lanarkshire, imported pig

carcases were found to be affected with the disease. This led to fuller investigation of imported pig meat and it was found that three separate shipments of pig carcasses from Rotterdam were infected. Two of the cargoes of affected carcasses were from Belgium and had been landed at Leith in May 1926. The third cargo was from Holland and had been landed at Newcastle in the same month.

As a result of this experience, legislation was introduced to prohibit the importation of carcasses from countries which might be a source of foot-and-mouth disease. At the present time the necessary control is exercised by the Importation of Carcasses and Animal Products Order 1954.

In 1927 the Second Progress Report of the Foot-and-Mouth Disease Research Committee disclosed that virus could survive in blood in frozen or chilled carcasses for thirty to forty days, in bone marrow for as long as seventy-six days, and in bone marrow in wet-salted carcasses for over forty-two days. In view of the frequency with which primary outbreaks of foot-and-mouth disease had been observed in swill-fed pigs, it was at once realised that urgent steps were necessary to require boiling of swill before it was allowed to come in contact with animals. The Foot-and-Mouth Disease (Boiling of Animal Foodstuffs) Order was therefore introduced in 1927. The modern counterpart of this is the Diseases of Animals (Waste Foods) Order of 1957 which requires the boiling and safe handling of waste food to prevent the conveyance of disease, and provides for the licensing of all plants where kitchen waste is treated.

In 1938 an outbreak of foot-and-mouth disease was confirmed on a farm in Gloucestershire and it was reported that two days before it developed the disease the affected animal had been treated by injection with a glandular extract of foreign origin. A specimen of the glandular extract of the type used was obtained from the drug-house concerned and it was found to contain foot-and-mouth disease virus of the same type as that involved in the Gloucestershire outbreak. As a result of this episode the Foot-and-Mouth Disease (Sera and Glandular Products) Order of 1939 was introduced and is still operative. The Order makes it an offence to treat any ruminating animal or pig with a serum or glandular product unless the material is clearly labelled to indicate that its use has been authorised by the Ministry.

A further safeguard is contained in the Diseases of Animals (Therapeutic Substances) Order of 1952 which directs that no person shall manufacture for sale or import a veterinary therapeutic substance except under licence from the Minister of Agriculture and that no licence shall be issued for any substance which in the opinion of the Minister may spread any condition which is a disease for the purpose of the Diseases of Animals Act of 1950.

In 1952 a severe epidemic of foot-and-mouth disease which occurred in Scotland had been introduced by calves which had been moved from south-west England.

The premises from which the calves originated were free from foot-and-mouth disease but the calves had been fed during transit with milk obtained from a liquid milk depot at Crewe. Some of the herds which supplied the depot developed foot-and-mouth disease a short time later and it was clear that the milk had been infective on the day it was fed to the calves. Legislation today which guards against this danger is contained in the Calves (Feeding in Transit) Order of 1956. The Order requires that calves in transit by rail or road must not be fed with milk other than reconstituted dried milk.

It is now time to consider measures for eradication of this highly diffusible disease. Authority is derived from the Diseases of Animals Act 1950 to slaughter and pay compensation in respect of animals affected, animals suspected of being affected, and animals which appear to have been exposed to infection with foot-and-mouth disease.

To achieve eradication it is necessary, as quickly as possible, to locate all animals which come within these categories, slaughtering or isolating and detaining as appropriate; to prevent the spread of infection by control of general movement and by inspection, and to establish the source of infection in all cases. To succeed in this purpose veterinary control must be applied not only on the infected place but also within the surrounding infected area and, on occasion, over the country in general.

To facilitate the work, a local operations centre is at once set up in close proximity to the outbreak, if possible in a convenient hotel which can provide suitable office and residential accommodation for veterinary officers who are moved in to deal with the outbreak. A telephone service is connected without delay and the local agricultural community is advised by every means available of the address of this operational centre.

For many years it has been recognised as a matter of first importance in the prevention of spread of foot-and-mouth disease that, as soon as its existence is suspected, the premises on which the affected animal is located must be declared an infected place by the service of a notice on the occupier imposing a complete prohibition on the movement of animals, persons and things. Persons who are required to enter the premises, under written authority of the officer-in-charge, must be equipped with overall clothing and boots capable of being completely disinfected.

Since the virus of the disease can multiply only in the living animal it is important that as soon as the existence of foot-and-mouth disease is confirmed no time must be lost in arranging the valuation and slaughter of affected animals. Valuation, slaughter and disposal of carcasses obviously necessitate a certain amount of movement of suitably equipped persons on to and off the infected place. Arrangements must therefore be made at the outset for disinfectant footbaths to be placed at the entrance, and for the premises to be sprayed with disinfectant before other operations are commenced. After

the completion of slaughter and disposal of carcasses the premises must then be disinfected in detail.

Until 1922 it was customary to salvage for food the carcasses of apparently healthy contact animals but during the severe epidemics of 1923 and 1924 this was abandoned to enable staff to concentrate on the control of the epidemic. The practice of salvage was condemned by the Pretymann Committee, largely because it was thought to delay the operation of slaughter and disposal of animals. The practice was abandoned entirely in 1927 but during the Second World War it was re-introduced in an effort to save as much food as possible. Since, however, it is impossible to recognise animals which may be in an early, non-febrile, infective stage of the disease, it is likely that the meat from salvaged animals was infective in many cases and no salvage was carried out after March 1954. The Gowers Committee, which reported in July 1954, drew attention to the fact that the large and costly epidemic in Dumfriesshire in 1952 had been attributed by the Ministry to swill which became contaminated by meat salvaged from a Wigtownshire outbreak. The Committee made a firm recommendation that salvage should be discontinued, and a specific instruction to this effect, which confirmed recent practice, was issued by the Ministry.

Before the Second World War it was usual to dispose of carcasses by cremation. Shortage of fuel, however, and war-time black-out conditions, made it necessary to use burial as the method of disposal. With the development of mechanical excavators burial came more into favour and after the war, save in circumstances where water supplies might be endangered, or where the nature of the land was unsuitable, it became the method of choice, being generally regarded as quicker, more effective and less objectionable than cremation.

Until 1924 it had been the practice, in normal circumstances, to free the infected place from restrictions six weeks after the completion of disinfection. The Pretymann Report of 1925 criticised this as being too short an interval of time and, basing its view on the quite considerable number of cases in which disease had recurred during the widespread epidemic of 1923-24, recommended that the infected place should be kept under restriction for a longer period of time and that partial re-stocking only should be allowed for a trial period thereafter, the Ministry meantime retaining its control of the premises.

A freedom-procedure on these lines was introduced which, in the Report of the Chief Veterinary Officer for 1929, is described thus:

The normal practice is to allow animals to be brought onto the infected farm six weeks after disinfection has been completed or, alternatively, eight weeks after slaughter of the diseased animals whichever period is the shorter. The number of animals permitted to be brought onto the infected place at this stage is 50 per cent of the original stock. These animals are kept under

observation for three weeks and if at the expiration of this time they remain healthy all restrictions are removed.

The Report goes on to discuss cases in which disease was believed to have recurred as a result of infection persisting on the premises. Over the twenty-year period 1909 to 1928 these numbered 42 out of 5,554 cases dealt with by slaughter. In most instances the infection was believed to have persisted either in buildings of poor construction which were difficult to disinfect, or in feedingstuffs which had become contaminated with virus. At this time disinfectants of the coal-tar type were used as general disinfectants on foot-and-mouth disease infected places, although formaldehyde gas was being used to disinfect such items as feedingstuffs and clothing, and aqueous solutions of formaldehyde were being used to spray stacked hay. The efficacy of formalin for this purpose had been discussed in the Third Progress Report of the Foot-and-Mouth Disease Research Committee, issued in 1928.

The Fourth Report of the Foot-and-Mouth Disease Research Committee, published in 1931, disclosed that ordinary washing soda (sodium carbonate) dissolved in warm water at 4 per cent strength had been found to be particularly efficacious for the destruction of foot-and-mouth disease virus in the presence of organic contamination. The liberal use of this solution was adopted for general disinfection on foot-and-mouth disease infected places, and any contaminated feedingstuffs which could not be adequately disinfected were destroyed. These measures gradually proved that the period of partial stocking following an outbreak was an unnecessary restriction and this was discontinued in 1938. A standard practice then introduced was that, provided disinfection had been completed, infected places would be freed six weeks after the completion of slaughter or four weeks after the completion of disinfection, whichever was the sooner. This procedure has proved entirely satisfactory.

The need for urgency in tracing and taking appropriate action in respect of animals which have been moved off an infected place shortly before confirmation of disease is self-evident. Immediate slaughter of the animal is carried out if there is reasonable certainty that, although possibly infected, the animal is not yet infective. If, however, the animal is thought already to be infective (although not visibly affected) it is preferable to maintain it in isolation until the symptoms have had time to appear. Earlier slaughter would still make it necessary to isolate the herd for a full period of incubation and would consequently delay the whole process of confirmation of the disease and, in turn, of removing restrictions from the infected area. Each case must be decided on its merits having regard to the incubation period of the disease and the duration of the existence of the disease on the premises from which the animal came, but routine procedure is followed to this extent: if the interval of time is not more than three days since movement, and if the animal is healthy on examination, it is slaughtered. A

matter of equal importance, if of somewhat less urgency, is the need to trace the movement of all persons from the infected place, and of materials which have been moved from the infected place, in order that appropriate action may be taken in cases where the movement of these persons or things has endangered the health of animals. The importance of prohibiting all movement from an infected place as soon as foot-and-mouth disease is suspected has already been mentioned. The Pretymann Report of 1925 attributed the extent of spread of the disease in Cheshire in 1923 in large measure to lack of supervision of movement from infected places, and it recommended that a continuous police guard should be maintained from the time of reporting of suspected disease until confirmation of the existence of disease by the Ministry's veterinary inspector. A standard practice now prevails of maintaining a continuous police guard from the time of service of the notice declaring an infected place until after the disposal of all carcasses. Thereafter a police guard is usually maintained during working hours to supervise the disinfection of persons and vehicles entering and leaving the premises.

When the existence of foot-and-mouth disease is confirmed an infected area is declared which becomes immediately subject to the rules and restrictions detailed in the Foot-and-Mouth Disease (Infected Areas Restrictions) Order 1938.

The plotting of an infected area is put in hand at the headquarters of Animal Health Division as soon as a report of suspected foot-and-mouth disease is received. The area is defined as a radius of about ten miles around the farm where disease is suspected, the lines of parish boundaries being followed where possible. The location of slaughterhouses and bacon factories is carefully considered so that the area, as finally determined, shall include facilities to deal with animals which become ready for slaughter in the area. On confirmation of disease the Order declaring the infected area is made and sent out by teleprinter network to all authorities and organisations immediately concerned. Telephone arrangements are such that a headquarters veterinary officer can be contacted at all times, and stand-by clerical teams to prepare infected areas are on duty at headquarters at all week-ends and holidays.

This area, surrounding the foot-and-mouth disease infected place, is the district in which animals are regarded as being at greatest risk. The movement of animals into and within the area is allowed only in cases of absolute necessity and then only on licence. There is an absolute ban on the movement of animals out of the area. Markets are forbidden, except that markets for fatstock for immediate slaughter may be licensed subject to veterinary inspection and provided they are more than five miles from an infected place. Many activities likely to spread the disease are either controlled or completely prohibited. Clearly, within this area the risk will not be uniform and animals on farms in the immediate vicinity of the infected place will generally be at greatest risk. It has long been the practice, therefore, to impose a

complete ban on the movement of animals on land contiguous to the infected place, and to submit them to regular (often daily) veterinary examination during the period of risk. The need for this careful control and supervision was initiated because of the danger of the conveyance of infection by the indirect means to which reference has already been made. The wisdom of the procedure was underlined, however, when it became known in 1931 from the Fourth Report of the Foot-and-Mouth Disease Research Committee that rats could become naturally infected with foot-and-mouth disease; and further emphasis was given when, in the Fifth Report, published in 1937, an interesting discovery was published concerning the disease in hedgehogs. This was that foot-and-mouth disease virus had been recovered from the blood and internal organs of a hedgehog which had been killed on an infected place in 1933, and that it had been shown experimentally that the disease could be transmitted by contact from hedgehogs to cattle and from cattle to hedgehogs. That this was of more than academic interest was proved when naturally infected hedgehogs showing specific lesions of the disease were found, both ailing and dead, in a series of outbreaks in cattle in Norfolk in the summer of 1946. Virus recovered from the tissues of the hedgehogs was the same type as that found in the outbreaks in cattle.

By an Order published in 1930 the Minister took the necessary authority to enable serum to be administered to animals which had been in contact with foot-and-mouth disease. From then until 1935, in selected cases, immune serum was administered to animals on contiguous premises and on premises to which infection might have been taken by man. This was done largely on an experimental basis. A number of treated animals developed the disease and the practice was abandoned in 1936 since no practical value in the treatment had been demonstrated and it was often difficult to diagnose disease in affected treated cattle.

A complete ban on movement of susceptible animals within a radius of two miles of an infected place is maintained for the first two weeks following an outbreak and all cloven-hooved animals within this area are inspected by a veterinary officer. This is a practice which has been followed ever since effective veterinary control of foot-and-mouth disease has existed. Its value has been demonstrated time and time again, not only in early detection of disease which has spread from the infected place but also, and perhaps even more important, in detecting an undisclosed primary outbreak which had given rise to the first reported case.

The development of artificial insemination of cattle on a wide scale introduced a new danger in foot-and-mouth disease infected areas because of the movement of inseminators between farms. In addition to the observance of a routine drill of disinfection at all times by inseminators, additional safety precautions within an infected area are required. On declaration of a foot-and-mouth disease infected area all artificial insemination must cease in it until authority in writing for its resumption is given

by the Ministry. Resumption is a matter for decision according to circumstance, but it is usually allowed on farms more than five miles from an infected place after an interval of three to seven days following confirmation of the disease; and on farms more than two miles from an infected place ten to fourteen days after confirmation. The following overriding provisions however apply: insemination may not be carried out from an insemination centre within an infected area, nor may it be used on farms which are subject to individual restrictions.

The necessary extent of an infected area and the duration of its operation are matters which have often been debated. Until 1920, whenever the disease was confirmed, a Prohibition of Movement Order was made banning all movements of animals within a radius of approximately fifteen miles of the infected place. Inspectors were, however, authorised to license movement in cases of exceptional urgency, such as bringing animals across a road for milking; and arrangements were made as soon as possible to allow movement of animals into the outer zone of the prohibited area for immediate slaughter. After about ten days the restrictions were usually modified to allow necessary movement under licence more than five miles from the infected place. After a further ten or fourteen days the restrictions were reduced to a five-mile area and withdrawn altogether twenty-eight days from the completion of slaughter. In 1920 these various stages were standardised in one general Order which was entitled The Foot-and-Mouth Disease (Control of Movement) Order and, in addition, in response to a recommendation of the Pretymann Committee, the Foot-and-Mouth Disease (Emergency Restrictions) Order was made in 1925. This Order gave authority to a veterinary inspector who suspected the existence of disease to impose an immediate standstill over an area of five miles radius from the infected place. This applied automatically on his signing a certificate to the effect that he suspected the existence of foot-and-mouth disease.

In response to another recommendation the Foot-and-Mouth Disease (Infected Areas Restrictions) Order of 1925 was made consolidating and revising the restrictions applied to infected areas. At this time the Ministry also amended its procedure for reducing the extent of the area in uncomplicated cases, so that it was reduced from a fifteen to a five miles radius after fourteen days and withdrawn completely twenty-eight days from the date of the last outbreak. The Report of the Chief Veterinary Officer for 1936 said, 'except in areas in which an isolated outbreak has occurred it has been the practice to reduce the infected area to one of a radius of two miles after twenty-eight days from the date of the last outbreak and to maintain the two-mile area for a further seven days as a precautionary measure.' The conclusion was reached that no additional risk would have been incurred if the restrictions had been withdrawn completely twenty-one days after the last outbreak and it was decided that this would be done in future. However, movement restrictions applying to animals on the premises contiguous to the infected

place would remain in force for a further seven days. As a result of a recommendation of the Gowers Committee in July 1954 the standard size of the infected area was reduced from approximately fifteen to a ten miles radius. It is reduced to approximately five miles radius after fourteen days' freedom from the disease and withdrawn completely after a further seven days' freedom, except that restrictions are maintained on animals on contiguous premises for another seven days. Experience confirms that both the extent of the area and the duration of its operation are adequate to meet the normal needs of a foot-and-mouth disease emergency.

It is sometimes necessary, for example when it becomes apparent that animals in a large livestock market, or a group of markets, have been exposed to infection, to impose a temporary standstill on the movement of animals over a very wide geographical area in order to allow time for animals at risk to be traced and subjected to individual restriction. In these circumstances, areas known as 'controlled areas' may be declared in accordance with the Foot-and-Mouth Disease (Controlled Areas Restrictions) General Order of 1938.

Inquiry into the origin of infection is an essential part of foot-and-mouth disease eradication. An outbreak is either classified as *primary*, that is to say, having no connection with a known centre of infection in Great Britain or *secondary* if it arises from an existing centre of infection in this country. Primary outbreaks are ordinarily associated with the conveyance of infection either from Europe by indirect means or from South America by the importation of infected meat. Except in years of severe epidemics in exceptional circumstances, such as 1942, when the ratio of primary to secondary outbreaks was in the region of 1 : 16, the ratio has seldom exceeded 1 : 5 and in many years has not exceeded 1 : 2.

Bound up with the question of establishing the origin of an outbreak is the necessity of establishing the type of virus which is involved. There are seven immunologically distinct types of virus. Three, known as Types O, A and C, have been recognised for many years. More recently three new types were identified in territories of southern Africa and were designated SAT 1, 2 and 3 because of their geographical association. A further type, ASIA 1, has also been identified.

On enquiring into the origin of a particular outbreak the type of virus involved may give a valuable lead. For example, two outbreaks occurring in the same district might at first seem to be associated but the demonstration of differing virus types would be conclusive proof to the contrary and would emphasise the need for a separate enquiry into the origin in each case.

Perhaps the most noteworthy example in recent years of a virus type giving the lead to origin occurred in January 1960 when the virus type SAT 2 was demonstrated in an outbreak of the disease which occurred on a farm approximately one mile distant from the Animal Virus Research Institute premises at Pirbright, Surrey. This virus

type had previously been unknown in Great Britain except at the Research Institute, where it had been used in a recent experiment. An exhaustive investigation by the Institute and the Animal Health Division failed to establish a direct link between the Institute and the farm, and it was concluded that virus escaping through a ventilator of the isolation unit had probably contaminated ground in the immediate vicinity, whence it had been carried to the farm by ground vermin or birds. Following this incident the disease security measures were improved and air filtration was introduced to the isolation units.

Since 1892 when the first serious attempt to stamp out the disease was organised, the official policy has been subjected to criticism whenever a severe epidemic has been encountered. This criticism which, in recent years, has usually been accompanied by an advocacy of vaccination as an alternative to stamping out, has generally been made not only with a lack of understanding of the objective but also without appreciating the extreme infectivity of the virus, the limitations of vaccination or the economic seriousness of the disease to the livestock industry. Experience in countries where foot-and-mouth disease is endemic has shown that it can bring very serious loss to the livestock industry, so that in this country, which has enjoyed long periods of complete freedom from the disease, the aim has been to eradicate it with the greatest possible speed and at the least cost whenever it has been recognised. That eradication of the disease cannot be achieved by vaccination is emphasised in these passages from the Report of the Gowers Committee in 1954:

We found that in countries where the disease is endemic and vaccination alone is practised, vaccination is ordinarily not regarded as a possible means of eradicating the disease or as a preferable alternative to stamping out; its purpose is rather to reduce the incidence of the disease to a point where stamping out becomes possible. . . . The evidence we have quoted shows that most countries – perhaps all – would have recourse to this method if the incidence of the disease could be reduced to a point low enough to make it practicable.

There are three ways in which vaccination may be used. The first is to vaccinate all the susceptible stock systematically. This is quite impracticable in Great Britain which has a population of some 43 million cattle, sheep, goats and pigs. The cost of regular annual vaccination of the cattle alone would be much greater than the average amount of compensation for animals slaughtered. There are, as has been said, seven types of viruses all requiring specific vaccines, though invasions of only three have been experienced. No method of vaccination has been developed which has proved of practical value to protect pigs, yet many primary outbreaks occur in these animals. In many parts of Great Britain foot-and-mouth disease is rarely experienced, but animals move freely all over the country, and it would therefore be inadvisable to limit vaccination to specified areas where outbreaks have occurred in the past.

The second way in which vaccination may be used is to protect the animals in areas most prone to infection from outside sources. In Great Britain this might be in the counties in eastern England, where primary outbreaks from European sources have been experienced, but it would also require to be done in all those widespread but unpredictable districts where primary outbreaks have occurred as a result of contact with garbage or swill. This is impracticable.

Thirdly, vaccination might be used to protect the stock around primary outbreaks. To be effective this must be done immediately, but there is bound to be some delay, and since spread of infection from the primary focus usually occurs very quickly, it is likely to be too late. The over-all average number of secondary outbreaks arising from each primary case is in the region of 3·5, and in a high proportion no secondary outbreak is seen, which indicates that the method practised at present is most effective in preventing or minimising the escape of infection from the first outbreak.

It would be a retrograde step to adopt vaccination in Great Britain. Many countries have so reduced the incidence of disease by control methods which include vaccination that they have reached the stage when they are adopting a stamping-out policy. Gradually they will be able to discontinue vaccination so that their stock becomes susceptible and may be expected to show more frank evidence of disease when subjected to infection: this, of course, makes it possible to achieve early discovery of disease which is so important in a stamping-out policy.

Today there is no need to argue the case for the present policy. The most ardent advocates of vaccination will hardly be vocal in circumstances where no disease is encountered. Vaccination under any of the systems discussed is not only unnecessary but inadvisable in Great Britain where, because of its island situation, most of the routes by which the virus may enter can be blocked. Nevertheless, vaccination has been of inestimable benefit in reducing infection in those countries from which virus was wont to arrive here, so that at the end of 1964 Great Britain has enjoyed freedom from infection for over two and a half years, longer, indeed, than at any time since February 1908.

ANTHRAX

ANTHRAX must have existed in Great Britain from remotest times but no restrictive measures were adopted to check its spread until 1886. The disease is of considerable historical interest as it was the subject of intensive investigation during the second half of the nineteenth century by research workers who laid the foundation of modern bacteriology. It was the first of all infectious diseases of man and animals shown to be caused by a specific organism. Pollender discovered the anthrax bacillus in 1855. Ten years later Davaine, who had demonstrated the presence of rod-like bodies of a special

kind in the carcasses of animals dead of anthrax, showed that inoculation of blood containing these rods, even when very highly diluted, set up the disease, whereas the inoculation of blood without such rods did not. Cohn in 1870 showed that the anthrax organism was capable of developing into very resistant spores when conditions became adverse for its further growth, but that when the conditions of temperature and nutrition became favourable these spores would revert to the vegetative or growing form. Koch showed that it was only by the inoculation of this organism or its spore that anthrax could be set up in animals.

Although the bacillus of anthrax itself is not very resistant to heat or to the ordinary disinfectants at approved dilutions, the spore is one of the most resistant forms of organisms known. Anthrax bacilli resolve themselves into spores whenever they are exposed freely to air or oxygen at a suitable temperature. The lack of oxygen in the intact carcase of an animal which has died of anthrax prevents the development of spores, but if the bacilli are liberated from the body through the natural orifices or by cutting into the carcase sporulation will occur if the temperature is satisfactory. It is for this reason that the cutting and evisceration of suspected or affected carcasses is prohibited. Anthrax spores will survive for many years in soil, water, hides and bones, resisting dryness, moisture, cold and heat. In the British Isles the temperature is rarely favourable for the bacillus to live and multiply outside the animal body but the spores will live for years in such a cool and temperate climate. The disease is most frequently found in tropical and sub-tropical countries.

Animals become infected by ingesting spores with food or water. The spores, under the ideal conditions of moisture and temperature of the alimentary tract, resume the bacillary form and multiply. In cattle and sheep the bacilli then invade the blood stream, where multiplication becomes more rapid, and finally cause death from septicaemia, frequently without symptoms having been observed. In pigs and horses invasion of the blood stream is comparatively rare and it is more common to find a hot, painful swelling in the region of the throat which causes death from suffocation. It is not uncommon, however, to find an intestinal form of the disease in pigs where the only symptoms observed are those of digestive disturbance, for example, diarrhoea or constipation.

The Anthrax Order of 1886 was made in response to the urgent solicitation of various local authorities to empower them to regulate the movement of animals from premises on which anthrax had occurred, to cleanse and disinfect the premises where diseased animals had been kept, and to dispose of carcasses of animals dead of the disease by burial or other means. No powers were given to slaughter affected or contact animals, as animals usually die without premonitory symptoms and as the disease is not transmitted by contact with a live infected animal.

It was appreciated then, as it is now, that anthrax is a disease which can be excluded

from Great Britain only by the exercise of intolerably severe control measures to prevent entry of the organism by one or other of the numerous channels by which it may be introduced, and the epidemiology of the disease does not warrant such restrictions. Exclusion being a practical impossibility reasonable control measures are employed, having regard to the important trade in imported feedingstuffs and animal products.

Judging by the number of cases dealt with subsequent to the regulations which came into force in 1886, very little effort appears to have been expended to check the disease until 1892. There was ample evidence of the spreading of anthrax through ignorant or careless actions. For example, the hide might be removed from an animal found dead in a field and sent to the market, and the carcase cut up and given to pigs or taken uncovered to a knacker's yard to be destroyed or utilised, so distributing the spores. Many local authorities had requested that power should be given to slaughter and pay compensation, on the basis that in some cases the disease might be stamped out on premises where only a few animals were kept, with less inconvenience than attends the ordinary methods of isolation. The Anthrax Order of 1892 which came into operation at the beginning of 1893 granted those powers but it allowed an owner to appeal to the Board of Agriculture if for any reason he should deem slaughter to be undesirable.

Local authorities were advised that when slaughtering diseased animals or destroying carcases they should avoid the effusion of blood as far as possible. Burial in quicklime was said to be the most sensible and effective method of disposal as it was known that the organisms soon die when access to air is prevented; but when carcases were destroyed by burning or boiling it was generally necessary to cut them in pieces, and this process was not only dangerous to the persons employed but was calculated to spread the disease unless the utmost precautions were observed and disinfectants used liberally. Some of the local authorities who availed themselves of the powers of slaughtering and paying compensation did so rather too freely. In several cases animals reported as having died from anthrax were shown to have died from other causes. The provisions for slaughter and compensation in cases of anthrax were included in the Order of 1895 but were omitted from the 1899 Order.

Anthrax was dealt with under the Anthrax Order of 1899 until the 1910 Order was introduced on 1 January 1911. During the years from 1905 to 1910 an enquiry into the epidemiology of anthrax in cattle was conducted and showed that about 84 per cent of the outbreaks occurred on previously clean farms; that the death rate on any one farm was seldom high unless the carcase of a diseased animal had been handled carelessly, the average number of deaths per outbreak being 1·3, and that in Great Britain the disease showed no great tendency to recur on the same farm. It followed, therefore, that infection from a previous case could only account for 16 per cent of the outbreaks,

although it did not necessarily follow that all those outbreaks arose in this way. The enquiry also showed that the vast majority of outbreaks must have originated by infection being introduced to the premises, the circumstantial evidence pointing to contaminated feedingstuffs.

Training in field techniques of bacteriological examination was not of a uniformly high standard at the turn of the century. Apparently there was a lot of inaccuracy in diagnosis and most of the errors were on the safe side to the extent that some 30–40 per cent of the confirmed cases were not, in fact, due to anthrax. It was impossible to obtain a correct estimate of the prevalence of the disease without establishing something in the nature of central control and a uniform system of diagnosis. Accordingly, from the beginning of 1911 the Board of Agriculture received notification of all reported outbreaks including those in which the veterinary inspector of the local authority had concluded by his examination that the disease did not exist. When the veterinary inspector was not so satisfied he sent samples of blood, other body fluid, or tissue of the carcase to the Board's Veterinary Laboratory for further investigation by microscopical, cultural or biological examination. The advantage of centralised diagnosis was immediately reflected in a drop in the number of annual outbreaks, from 1,496 in 1910 to 908 in 1911. Centralised diagnosis has continued to the present day with only minor changes in the laboratory procedures. The routine method of checking on a negative microscopical examination was by the inoculation of guinea-pigs by scarification. For about two years, commencing in 1952, comparisons were made between the inoculation of guinea-pigs and a new method of inoculating tubes of whole, fresh, defibrinated ox-blood. The new method proved to be not only more reliable but quicker and had the added advantage of not involving laboratory animals. It was adopted in 1954 as a routine measure.

In 1928 two weaknesses were revealed in the 1910 Order. Firstly, it did not apply to four-footed animals kept in zoological collections other than animals of the species included within the definition contained in the Order. Secondly it did not prohibit the cutting of a carcase, suspected of anthrax and reported by the owner, before the veterinary inspector of the local authority had certified it. A new Order was made in that year which introduced amendments in these and certain other respects.

Anthrax is brought to this country in infected hides, skins, bones, wool and hair. The more obvious sources of infection in this country are the effluents from tanneries, wool mills and factories of allied trades but these, of course, are confined to certain well-defined zones and in such districts vaccination against the disease is frequently practised. For many years pastures in the river Nene valley in Northamptonshire, believed to have become contaminated by the overflowing river which is polluted by the effluent from tanneries, showed evidence of infection with anthrax organisms. Heavy losses of stock occurred along a stretch of the river between the borough of

Northampton and the county boundary; nineteen animals died of anthrax in 1939 and the number rose to forty-eight in 1943. During these years experiments were carried out at Weybridge with a spore vaccine developed by Sterne in South Africa which gave satisfactory protection to cattle and sheep. Prior to this, vaccine first produced by Pasteur in 1881 was the only available method of immunisation, and it involved the use of a live vaccine of variable virulence occasionally resulting in mortality—a risk which the incidence of anthrax in this country did not warrant. It was found that this risk did not apply to the spore vaccine and its use was adopted during the next four years (1944–47) in the Nene valley when nearly 5,000 animals were vaccinated. Of these, six died of anthrax, one of which was in the incubative stage of the disease at the time of vaccination, while the other five were moved to the infected pastures before the vaccine had had time to confer protection. Cases of anthrax continued to occur and it was recorded in 1948 that no cases of anthrax occurred in any of 833 vaccinated animals but eleven unvaccinated cattle contracted the disease. Until the latter part of 1951 the Ministry provided spore vaccine to veterinary surgeons free of charge for use in approved areas where there was continuing risk of infection from tannery effluent, and recommended that the animals should not be moved to suspected pastures until at least fourteen days after vaccination.

Although conclusive proof is lacking, there is ample circumstantial evidence that imported feedingstuffs or artificial manures of animal origin are responsible for the great majority of outbreaks which have occurred in this country during the past fifty-five years. The consumption of carcase meat from unreported or undiagnosed cases fortunately occurs only rarely, but when it does the results can be disastrous as, for example, in 1950 when 603 mink died from the disease. At the Zoological Gardens, Chester, in 1964 five racoons, four grison, a marten and a badger succumbed after eating infected meat from the carcase of an elephant which had died in the Zoo, and three other elephants died as a result of contamination of their compound with blood spilt when the carcase of the first elephant was dissected.

Imported feedingstuffs of vegetable origin have been shown to be infected and these must become contaminated by spores either in the country of origin or in transit between that country and Great Britain. This is possible in several ways. The crop may have been contaminated by the carcasses of animals which have died from the disease. When contaminated linseed and cotton seeds are made into cake the oil-extraction process may not always be adequate to destroy the anthrax spores. Feedingstuffs may acquire the infection in warehouses or on the quayside at the port of shipment by contact with infective materials of animal origin, but it is more probable that they become contaminated in the vessels in which they are transported to this country either by contact with dried hides, wool, hair or bones in the holds or through previous contamination of the holds with such merchandise. As a precaution against contamination on

board, the Ministry has issued on more than one occasion a special leaflet for distribution to shipping companies urging them to take precautions to prevent such goods as dried hides, wool, hair or bristles being carried, mixed with or placed on top of grain or feedingstuffs; and recommending at the same time that thorough disinfection should be applied to any hold or other part of the vessel after the removal of such cargoes, and emphasising the resistant nature of the anthrax spore.

Bones are imported into this country for various purposes, but chiefly for the production of glue and gelatine, for making bone charcoal used in sugar refining, and for fertilisers. Bones from healthy slaughterhouse animals are preferred for the glue and gelatine trade and the process of extraction constitutes an effective method of sterilisation. The residues of processed bones are used as animal food supplements and enquiries from the trade have established that no unprocessed bonemeal is intentionally used for this purpose. In countries where livestock graze over enormous tracts of pasture and are inspected only at irregular and infrequent intervals, and where the veterinary sanitary services are under-developed, the hide may be removed from an animal that has died of anthrax and subsequently find its way to the leather industry, or the carcase may remain to be devoured by insects and birds of prey. The skeletons of these animals when dried and bleached by the sun may be collected for exportation as 'sun-dried' bones.

In this country no attempt is made to sterilise bonemeal intended for use as fertiliser because its quality would be reduced and because the process is too costly. In view of the fact that it may have been manufactured from sun-dried bones, some of which may have originated from anthrax carcasses, it constitutes a potential source of infection. Imported bone-and-meat meal is used as a supplement of animal feedingstuffs but may be sterilised. Feedingstuffs may be contaminated by second-hand bags in which infective raw material has been carried, or by grinding and mixing machinery previously used for unprocessed bones.

When a particular consignment of imported feedingstuffs, bones or bonemeal is contaminated it is, of course, not apparent. The number of outbreaks of anthrax which occur depends to a large extent on the degree of contamination and the distribution of the particular consignment. When the degree is severe and the distribution wide many outbreaks may be expected. This occurred in the last two months of 1964 when 303 outbreaks were confirmed involving 62 counties in Great Britain. In the laboratory anthrax organisms have been recovered from various materials but it is a tedious and difficult procedure. Because the amount of contaminant is minute in relation to the bulk of the material in compound feedingstuffs or balanced rations, a negative result to a laboratory investigation is of no value and a positive one does not identify the ingredient responsible.

One of the biggest difficulties in controlling anthrax throughout the years has been

the omission on the part of some stock-owners to suspect the disease and to avoid cutting the carcase until it has been proved that the animal did not die of anthrax. As many as 15 per cent of cases confirmed are diagnosed as anthrax after the carcase has been cut. On more than one occasion since 1925 warning notices to stock-owners, butchers and others against the danger of cutting carcasses of animals suspected of anthrax have been distributed to local authorities and chief constables.

Anthrax, then, is a disease which is under good control in the conditions prevailing in Great Britain. Losses fluctuate around a low annual incidence and this situation is likely to continue, for the price of the elaborate methods that would be needed to reduce the incidence still further may be too great, although these are being further studied. Certainly the prohibition of imports of useful feedingstuffs and fertilisers is not justified by the loss from the disease.

BOVINE PLEURO-PNEUMONIA

CONTAGIOUS bovine pleuro-pneumonia is one of the most serious animal plagues and its eradication from Britain in 1898, nearly sixty years after it was introduced, was a great achievement. In the Order which is still in force to deal with it, the disease is known as pleuro-pneumonia. It is a slowly progressive disease of cattle, affecting the lungs, with an incubation period varying considerably but averaging about forty days. The symptoms include fever, inappetence, coughing and respiratory distress. The cause is now known to be *Mycoplasma mycoides*. Not all infected cattle develop clinical disease; some may become symptomless carriers and these are now known to be the chief obstacle to eradication. Mortality varies from 10 per cent upwards and may reach 90 per cent in some outbreaks when additional stress factors are present.

Pleuro-pneumonia was first introduced into the United Kingdom about the year 1840 when it was known as the 'lung disease' or the 'new disease'. It is said to have been introduced into the Cork area in 1840 by pedigree cattle from Holland and was prevalent in London cowsheds in 1842. Trade in cattle during and after the Napoleonic wars had spread the disease throughout most of Europe and it was later conveyed by infected cattle to South Africa, the U.S.A. and Australia. In Australia the disease has persisted in certain places to the present day but a promising national eradication programme is now in progress. It is still present in several African countries and in other parts of the world where eradication is not yet feasible.

From 1840 to 1870 there is no official information on the incidence of pleuro-pneumonia but there is little doubt that it caused very heavy losses. Statistics from various cattle insurance societies suggest that half their claims arose from pleuro-pneumonia. Many such societies failed financially because they under-estimated the growing

incidence of the disease. Gamgee estimated the average loss of horned cattle from all causes in Great Britain and Ireland from 1854 to 1860 to be about two and a quarter million cattle worth £26 million. 'Of this number there died from pleuro-pneumonia considerably above one million during the six years and these represented a value of about 12 million sterling.'

It was in the town dairy farms, flying herds of dairy cows kept in the heart of the larger cities to supply fresh milk, in which pleuro-pneumonia was most prevalent. The largest dairy was in Glasgow and it housed 1,700 cows and heifers. In a survey of eighty-eight Edinburgh dairies during the twelve months ending 1 July 1862, Gamgee showed that out of a total of 1,839 cows, 1,075 were sold for slaughter because of disease, and pleuro-pneumonia was the main cause of loss. Town farmers became expert at detecting early signs of pleuro-pneumonia and, knowing that treatment was usually quite ineffectual, they learned to send affected cows for slaughter before any serious loss of condition had taken place.

It is perhaps fortunate that the practice of immunising cattle against this disease by the inoculation of infective lung material into the tail-tip was never extensively adopted in Britain. The method had been developed by Dr Willens on the Continent in 1852 and had been investigated by Dutch, Belgian and French governments at various times. Conflicting evidence had been presented but the method had been widely adopted in certain countries: immunisation was achieved in many cases, but in other cases the results were unsatisfactory. In Britain inoculation was, however, adopted in town dairies in London, Edinburgh and Glasgow with considerable success and, indeed, a modification of the method is still in use in those countries where pleuro-pneumonia is endemic. There was, nevertheless, a 'feeling against inoculation' in Britain in 1864 largely because of the incompetent manner in which it had been performed in certain instances. This was perhaps as well, for had inoculation been more successful eradication would probably have remained an ideal beyond achievement.

From 1842 the importation of cattle into Britain was resumed and, although there was authority to detain diseased cattle at the port, cattle in the incubative stage or carriers of the disease could enter the country without check. British cattle carried the infection to Sweden in 1847 and to Australia in 1858.

Rinderpest, introduced in 1865, killed 400,000 cattle in two years and many of the flying herds in which pleuro-pneumonia was prevalent, succumbed: eradication, however, was not to be achieved for many years.

The Contagious Diseases (Animals) Act 1867, with the first mention of pleuro-pneumonia in British legislation, made it an offence to expose an affected animal at a market or fair. The Contagious Diseases (Animals) Act 1869 gave local authorities power to prohibit the movement of animals, except for slaughter, from farms where pleuro-pneumonia existed, but after thirty days had elapsed without a new case of the

disease the restrictions had to be withdrawn. The disease, however, became notifiable by the Animals Order of 1869, made under the Act of that year, and so from 1870 onwards there are official, if inaccurate, figures for its incidence.

A Select Committee on Contagious Diseases (Animals) was appointed in February 1873, and reported five months later. It recommended that all cattle affected with pleuro-pneumonia should be compulsorily slaughtered with compensation and that restrictions on the rest of the herd should remain in force for two months. An Order was made two years later in 1875 requiring local authorities to slaughter affected cattle and to pay compensation at 75 per cent of the market value of the animal up to a maximum of £30.

The slaughter of affected animals served to reduce the rate of spread of the disease, but eradication was hindered by the many contact animals which became symptomless carriers and therefore sources of infection to susceptible stock. Local authorities were given the option of slaughtering cattle which had been in contact with diseased stock by the Contagious Diseases (Animals) Act 1878, and this provided for 100 per cent compensation to be paid up to a maximum of £40 for each such contact. The detention period which had been fixed at thirty days in 1870 was now extended to fifty-six days.

Inevitably there were differences of opinion and inconsistent action by local authorities. The restrictions were considered irksome, and as local money was involved the slaughter of contact animals did not prove popular. Each authority could only deal with outbreaks in its own district whereas the trade in dairy cows involved movements of cattle over wider areas. This was the situation for the next twelve years and the local authority control, although imperfect, does appear to have had some effect on the incidence of pleuro-pneumonia, for the number of outbreaks fell from 1878 onwards. The Veterinary Department of the Privy Council was able to advise local authorities and to encourage them to deal vigorously with the disease, but had little direct influence on the situation.

By the Animals Order 1884, the movement of cattle on to a pleuro-pneumonia infected farm was prohibited until all the cattle on that farm had been slaughtered or otherwise removed. This was a step in the right direction and involved acceptance of the fact that clinical examination of contact cattle could not be relied upon to detect all infective animals.

There was a great deal of discussion concerning methods of eradication during the next few years but no real progress was made. The incidence in 1887 appeared to be lessening for only 2,437 cases were reported out of a total cattle population of 6.5 million. Interest now centred on the need to trace the origins of diseased cattle in confirmed cases, and local authority inspectors were asked in all instances to report details of the number of cattle on the farm, the number affected, recent purchases or sales

of cattle, details of cattle which had died recently and the cause of death, and information about their contacts. The Agricultural Department of the Privy Council was thus provided with valuable information. During the first year 89 per cent of the outbreaks were apparently associated with recently purchased cattle which were the first to show symptoms of pleuro-pneumonia. Common origins were found for several outbreaks and sixteen cases were detected in slaughterhouses, leading to the disclosure of further outbreaks.

Where the local authority slaughtered contact animals, post-mortem examinations by Government veterinary inspectors showed 50 per cent to be affected. Consequently, and supported by strong representations from the RASE and similar bodies, it was decided to make slaughter of contact animals compulsory. This was given effect by the Pleuro-Pneumonia Slaughter Order of 1888 which required cattle which had been in contact with the disease, or in any way exposed to infection, to be slaughtered within ten days of confirmation of exposure to infection or within any period specified by the Privy Council. While awaiting slaughter their tails were to be clipped and after slaughter the farm had to be satisfactorily disinfected.

Another Order made that year was the Pleuro-Pneumonia (Infected Circles) Order 1888. This, made under the provisions of the Act of 1886, applied to pleuro-pneumonia the circle regulations which had been applied to foot-and-mouth disease generally since 1883, and to swine fever in a few districts since 1884. It had the effect of automatically prohibiting all cattle movements within half a mile of an infected place. This Order was revoked in 1891.

The Order of 1888, making slaughter of contacts compulsory, met with considerable opposition, particularly from the London dairymen, who feared for their milk supply, and also from the Highland and Agricultural Society of Scotland which favoured inoculation of contact animals. As a result of these representations a departmental committee, which was appointed to enquire into pleuro-pneumonia and tuberculosis, made a number of very far-seeing recommendations, practically all of which were eventually accepted. Two of the recommendations were that the Government should take over responsibility for the slaughter of healthy and diseased stock when pleuro-pneumonia was confirmed, and that a central fund should be set up to pay compensation. These recommendations were put into effect by the Contagious Diseases (Animals) Pleuro-pneumonia Act 1890 which relieved the local authorities of the duties of slaughter and payment of compensation and transferred the responsibility to the Veterinary Department of the Board of Agriculture and the imperial funds. Provision was made for the opening of a Cattle Pleuro-Pneumonia Account for Great Britain at the Bank of England and for an annual vote by Parliament of £140,000.

The immediate result of the new Act was a vast increase in the work of the Veterinary Department. Whenever suspected pleuro-pneumonia was reported instructions

were sent to the veterinary inspector of the local authority or to some nearby veterinary surgeon to slaughter the animal or animals, and to send the lungs and a full report to the Royal Veterinary College, London, for a decision by the veterinary inspectors of the Board. If pleuro-pneumonia was excluded the restrictions were withdrawn; if it was confirmed, a travelling inspector, a layman, was immediately sent to the place to take charge of the premises and, with the help of the local veterinary surgeon, to organise the valuation and slaughter of all the affected stock and their contacts. The travelling inspector also arranged any necessary tracing of animals, the sale of carcasses of contact animals (after post-mortem examination by a veterinary surgeon) and advised the local authority on the general position.

The tracing of contact animals was carried out with a thoroughness quite impossible under the previous regime, for the travelling inspectors could move freely about the country whereas the local authorities had been unable to operate outside their own boundaries. All contacts generally were traced and slaughtered and afterwards their carcasses were examined by a veterinary surgeon for evidence of disease.

An interesting result of these post-mortem examinations was the light they shed on the incidence of tuberculosis in dairy cows: 25 per cent of London cows examined post-mortem were found to be affected. This information was particularly useful as the possibility of making tuberculosis a notifiable disease with a view to its eventual eradication was then being actively discussed.

The travelling inspectors who normally spent most of their time supervising the enforcement of regulations affecting the transit of livestock and the Markets and Fairs (Weighing of Cattle) Act must have found their new and heavy responsibilities extremely arduous. However, the efforts of the Department met with considerable success. The efficient application of the slaughter policy coupled with movement control over wide areas—an Order of 1891 prescribed scheduled districts in place of infected circles and infected areas—quickly reduced the incidence of pleuro-pneumonia from 2,057 cases in 1890 to one in 1895. This was a tremendous achievement.

In 1896 only seven cases of pleuro-pneumonia were confirmed, all in London cowsheds where, indeed, the disease had first been troublesome. Special action was taken under the Cowsheds Pleuro-Pneumonia Order, made in August 1897, which prohibited the movement of cows out of any cowshed in the East End of London except under licence for slaughter locally. The Board appointed three temporary veterinary inspectors to issue licences and make post-mortem examinations. There were 233 cowsheds in the area containing 2,742 cows when the Order came into force. Ten months later when the Order was withdrawn the number of cows had been reduced by 2,052, all of which had been slaughtered. In the course of post-mortem examinations, five cases of pleuro-pneumonia had been detected. In the last episode only one animal was affected but as a result of thorough tracing of possible contact animals 220 cattle were slaughtered in

London, Surrey, Essex and Wiltshire. This case occurred in January 1898 and proved to be the last case of contagious bovine pleuro-pneumonia in Great Britain.

Thus, nearly sixty years after its introduction, pleuro-pneumonia was eradicated and a serious threat to the livestock industry had been removed. For thirty years from its introduction the disease had been unchecked. For the next twenty years it had been subject to control by local authorities; but it was only as a result of a final period of eight years' intensive and centrally directed campaigning, during which diseased cattle and their contacts were ruthlessly traced and slaughtered, that this plague was finally eradicated.

Later in the year that saw the eradication of pleuro-pneumonia from Great Britain, French workers discovered and described the causal organism.

SHEEP-POX

THE first recorded case of sheep-pox in Britain in the nineteenth century was diagnosed on 4 September 1847 by J. B. Simonds, then lecturer in cattle pathology at the Royal Veterinary College, in a flock at Datchet, near Windsor. The source of the infection was identified as fifty-six Spanish-Merino sheep imported from Tonningen and purchased at Smithfield market in July. Shortly afterwards infected sheep were imported on several occasions and the disease spread through market contacts to many parts of Britain. Heavy losses, with mortality as high as 50 per cent on occasion, were suffered on many sheep farms. This series of outbreaks continued until 1850 when the disease disappeared.

The importation of foreign animals into Britain had been forbidden for many years until, in 1842, under the stimulus of the ideas of free trade, the importation of foreign cattle and sheep was once again permitted on payment of duty. Very few sheep were imported under these conditions but when in 1846 the duty was removed there was an immediate increase, 139,371 sheep being imported in 1847 compared with 15,845 in 1845. Sheep-pox was prevalent in Europe at this time and the intensive drafting of sheep to supply the booming British trade inevitably had the effect of promoting the spread of the disease. Many of the foreign sheep imported into Britain went for slaughter, but others were sent into the country for fattening.

Simonds handled the situation with considerable understanding and skill. In the first case at Datchet, and on later occasions, he had the benefit of advice from the physicians of the Small-Pox Hospital which had been established in 1746 to assist poor persons affected with small-pox and to provide free inoculation for children. Simonds used sheep from the Datchet case to institute a series of experiments showing that sheep-pox could be transmitted by inoculation and by contact, and proving the efficacy of vaccination

or ovination as it was called. This practice had been widely used for some years in those parts of Europe where sheep-pox was prevalent.

Simonds also told the Board of Trade about the outbreak and of its apparent origin, made suggestions for the control of the disease, and recommended that importations of sheep should stop. Shortly afterwards the Board asked customs officers to detain any sick sheep for inspection by a competent person, but there was still no legislative provision for control of the disease.

It was twelve months after the diagnosis of sheep-pox before any legislative action was taken and meantime there were extremely heavy losses. On 4 September 1848 two important Acts of Parliament came into force designed to prohibit importation of sheep and to control the spread of the disease.

Sheep-pox disappeared from Britain in the sense that by the end of 1850 no further cases were being recorded. It is difficult to determine why this happened. It is probable that the relative isolation of most of the flocks had an effect, and the provisions of the 1848 Act might have limited the spread of the disease but, on the other hand, Orders were not immediately made under it. It remained longer in the districts where there was a denser sheep population such as the eastern counties but in these areas ovination was more commonly practised and this may have tended to prolong the outbreaks. However, the incidence of the disease had declined on the Continent, and the inspection at the ports under the 1848 Act, besides occasionally detecting an infected cargo, discouraged merchants from handling suspect sheep. Also, although importation continued at a great rate, most sheep went direct for slaughter.

Britain remained free from sheep-pox for the next twelve years. It was then re-introduced in 1862 when it was again diagnosed by J. B. Simonds in a self-contained flock in Wiltshire. Out of 1,700 sheep and lambs, 400 died and the disease spread to a contiguous flock and subsequently to several flocks in the district. Ovination was adopted in the early cases and was believed to have reduced the mortality from about 50 per cent to 3 per cent. Simonds was asked to report on the nature and progress of the disease by the Medical Department of the Privy Council and he submitted his first report on 8 September 1862. Gamgee also investigated the outbreak privately and he submitted unsolicited reports to the Privy Council, much to the annoyance of Professor Simonds who, according to Gamgee, 'threw every obstacle in my way'. Simonds failed to find a satisfactory origin for the initial outbreak in what was a relatively isolated flock, but Gamgee discovered that it was common practice for drovers of imported cattle and sheep, *en route* from Bristol, to avoid the turnpike road, and he showed that the infected flock was 'in the very heart of the drift thus unlawfully established'. Gamgee suggested that imported sheep being driven for slaughter in London introduced sheep-pox in this way. This supposition appears to be a reasonable explanation. During September, Simonds and Gamgee continued to send reports to

John Simon at the Privy Council Medical Department and Gamgee submitted his farseeing report on the Prevention of Epizootics on 1 November 1862.

Infected area restrictions were imposed by an Order made under the 1848 Act on 10 September 1862. Sheep farmers were required to notify suspected disease to the Chief Constable in writing. At the same time a circular letter was sent to all petty sessions in Wiltshire, Hampshire, Dorset, Somerset and Berkshire, asking the justices to appoint inspectors to check for sheep-pox in the markets.

The control of sheep-pox in the 1862 outbreak had greatly improved since the epidemic of 1847, essentially because of early diagnosis, which was no doubt facilitated by memories of the previous outbreaks, coupled with the fact that the 1848 Act was in force and the Privy Council, advised by Simonds, and pressed by Gamgee and the farming community, was prepared to take the necessary action. Furthermore, ovinisation was not extensively practised.

Sheep-pox was introduced into Britain on three further occasions and each time it was controlled without serious difficulty. The first of these outbreaks was in a flock near Newhaven in Sussex in June 1865. No origin was established and there was no spread. The second was discovered in January 1866 in imported Dutch sheep at Long Buckby, Northampton. The outbreak is of interest because of its human aspect in that it was because of a fund for compensation raised by neighbouring farmers that it was made possible to slaughter the flock. The last series of outbreaks in Great Britain began in March 1866 in Essex and there were also some outbreaks in Cheshire about that time. They were all remarkable for their low mortality and presented no difficulties in eradication. Movement controls, including infected area restrictions, were enforced and the disease disappeared without further action.

Sheep-pox has not been recorded in Great Britain since that year, although on several occasions thereafter it was discovered in cargoes of imported sheep whilst still at the landing places. Slaughter of the entire shipments effectively prevented the introduction of the disease.

By some mischance, returns of outbreaks of notifiable diseases have recorded the year of eradication as 1850. There is no doubt, however, that the last appearance of sheep-pox in native flocks in Great Britain was in 1866.

SHEEP SCAB

SHEEP SCAB is one of the oldest recognised maladies of animals, there being evidence that the condition was known in the time of Moses. It has since been recorded wherever sheep have been kept.

Sheep scab is not a disease in the strict sense. It is a condition of the skin due to infestation by mites (*acari*) which live on the skin surface, puncture it to obtain nourishment from the tissues of the sheep, and thereby cause intense itching and the formation of scabs over the affected areas. Affected animals are seldom at rest. They nibble the itchy parts with their teeth, or scratch them with their hind feet and rub continually against any fixed object. If the affliction remains untreated the *acari* may spread over the whole body surface, the fleece becomes ragged and broken, the sheep unthrifty and, in time, death may result from debility and exhaustion.

There are no figures available on which to estimate the economic loss which used to be caused by scab in Britain. In countries where sheep are kept primarily for wool production, as in Australia, the reduction in the weight and quality of the clip from an affected flock was obvious and the loss readily assessed. In Britain, where sheep are kept as much for their carcase value as for wool production, loss of bodily condition was probably of as great significance as damage to fleece. In the nineteenth century, when the disease existed in every county in Britain, the aggregate loss in a sheep population of over 25 millions must have been enormous.

The earliest British records date from Anglo-Saxon times. It was in this era that a Welsh king, Hywell Dda (Howell-the-Good), who died in AD 949, made an edict to the effect that 'the seller of sheep ought to be liable for warranty in case of scab from the Feast of All Saints to the Kalends of April'.

In 1870, the first complete year in which owners were obliged to report the existence of scab in their flocks, the returns which local authorities had to submit to the Privy Council showed 2,573 outbreaks in sixty-five counties. During the next twenty-five years the annual figures of outbreaks recorded fluctuated between 1,207 and 3,536 with outbreaks in every county of Scotland, England and Wales. There was a marked increase in the early 1890's, when it became obvious that merely making scab a notifiable disease was having no effect whatever on the over-all problem. Action was entirely in the hands of local authorities whose powers were very limited at this time. There was no provision for the isolation of affected sheep, for treatment of contacts, for tracing origins of affected animals, or even for diagnosis to be made necessarily by a veterinary surgeon.

A further complicating factor in control of the disease was the large number of infested sheep then being imported from the Americas and Ireland. Before 1896, cargoes of apparently healthy sheep from non-prohibited countries could be moved freely from the ports to any part of Britain. As a measure of the risk to British native stocks the 1895 figures of disease in sheep from the Argentine, Canada and the U.S.A. are illuminating. In that year scab was detected in 370 cargoes totalling 420,000 animals, of which no less than 83,000 were stated to have been infested. From later knowledge of the epidemiology of sheep scab, with its quiescent summer phase, it seems probable

that before 1896, in the summer months at least, scab was frequently introduced by sheep imported from across the Atlantic.

Dips for the control of scab had been available since William Cooper introduced his arsenic-sulphur dip in 1843, and cresol-base dips had been evolved in the mid-70s. Their rôle in the successful scab eradication schemes in New Zealand and Australia convinced progressive flock-owners that scab could be controlled and, as the success of the Board's policy for the control and eradication of the exotic diseases became apparent, so the earlier strong resistance of stock-owners to the restrictions necessary for dealing with endemic disease was being gradually overcome.

The 1898 Sheep Scab Order, for the first time, required local authorities to employ veterinary surgeons for all diagnostic enquiries and, wherever practicable, to secure isolation of infested sheep from their contacts. Although a step in the right direction, this Order was of little real value. However, its application resulted in or coincided with a sharp fall in the numbers of outbreaks; from 2,514 in 1898 to 1,379 in 1901. Until this date the Board had concentrated on dealing with the exotic imported diseases of animals. Stock-owners for their part were so accustomed to ectoparasites on sheep that they regarded scab as part of the pattern of sheep husbandry; really as a nuisance rather than a disease entity capable of elimination.

There was now growing support from agricultural organisations for a policy of general dipping of sheep as a means to reduce the incidence of scab to a point where eradication could be attempted. The powers necessary to secure this were incorporated in the Diseases of Animals Act of 1903. Before making any Orders dealing with sheep under the Act, the Board appointed a departmental committee under the chairmanship of Sir Henry Hall Scott to enquire and report on the essential constituents of efficient dips and other preparations for the treatment and dressing of sheep, and to recommend how these could best be employed. The Committee was also asked to report on the times and intervals at which sheep should be treated or dressed, 'regard being had to the life history and characteristics of the sheep scab acarus and the practical conditions under which sheep farming was carried on in the various parts of the United Kingdom'.

From July 1903 to May 1904 one of the members of the Committee supervised experiments in North Wales to determine the efficacy of sixteen home-made and proprietary dips in killing sheep ectoparasites. He reported that one dipping in a good dip was sufficient to cure scab and that any dip which killed scab acari also destroyed their eggs.

As a result of this finding, and of evidence taken from interested parties, the Committee recommended that all sheep should be dipped annually in dips approved by the Board. The Board accepted the conclusions of the Committee on the advantages of dipping but did not agree that compulsory annual dipping of all sheep in Britain could be enforced by local authorities.

In 1905 Orders were made enabling the Board to make regulations to require a single dipping of all sheep in defined areas and also to make regulations requiring a single dipping of sheep prior to their movement out of other areas. Central and northern Scotland was defined as a 'movement area'. There the flock-owners combined and agreed to a single dipping of all sheep under police supervision as an alternative to restrictions on movement of sheep. This mass dipping of over $3\frac{1}{2}$ million sheep demonstrated that compulsory dipping of flocks over a wide area was a practical proposition, and in 1907 annual single dipping of all sheep in Britain was made compulsory. It was anticipated that this national dipping, combined with strict enforcement of the Sheep Scab Order, would quickly reduce the incidence of scab to small proportions.

The number of outbreaks showed little change in the years 1906-10, a period in which it became evident that it was impossible to rely on a single dipping to effect permanent cure of clinical cases of scab. Moreover, there appeared to be a seasonal cycle of activity of the sheep scab acarus with virtual disappearance of clinical symptoms in infested sheep during the summer months.

To clarify the position the Board carried out further research at the Ministry's Laboratory into the habits and life-cycle of the sheep scab acarus. The results were summarised by the Chief Veterinary Officer, Sir Stewart Stockman, in his Annual Report for the year 1911. He concluded that the adult forms of the acarus were the most resistant and although a single dipping might often cure a case of scab, in practice it could not be relied upon to eradicate disease from a flock; therefore, compulsory dipping should require at least two dippings separated by a short interval of not much longer than eight days.

Stockman also made the point that a single dipping operated against eradication by causing temporary amelioration of symptoms for long periods without curing the disease, whilst giving a false impression that it had been cured. He suggested that dipping in the months just before the autumn sales seemed to promise the best results from the point of view of eradication in the flock.

These conclusions necessitated a general re-appraisal of existing procedures. Early in 1914 Orders were made providing for the double dipping of sheep on individual holdings and in specified areas, but the First World War intervened before the effect of these could be tested. It was 1920 before the principle of general double dipping of sheep could be applied.

Between 1900 and 1920 the annual totals of outbreaks fell by two-thirds, yet the number of counties involved remained almost constant. It was apparent that little progress was being made in the mountainous areas of Wales, Scotland and northern England where the inherent difficulties of obtaining complete gatherings of sheep off rough grazings, inadequate dipping facilities, and a spirit of *laissez-faire* in owners often

combined to defeat the full effect of the dipping Orders. Moreover, store sheep from these areas were regularly introducing disease to lowland farms in otherwise clean counties.

In a circular letter to local authorities accompanying the new Sheep Scab and Double Dipping Orders of 1920 the Ministry referred to the poor degree of compliance with earlier regulations, particularly in inaccessible districts, and intimated the intention to detail a number of Ministry inspectors to co-operate with local authorities in an attempt to secure the necessary measure of supervision of dippings and to search flocks for obscure cases of scab. At the same time the Ministry terminated the national annual single dipping of sheep which had been in operation since 1907. The 1920 Sheep Scab Order empowered local authorities to make their own regulations to require dipping of all sheep in their districts or of sheep moved into their districts. These 'into' regulations, which were made by ninety-six local authorities, were extremely helpful in reducing dealing movements of sheep and doubtless cut out many potential new centres of disease, but varying degrees of application by the many authorities were to remain a constant source of friction to flock-owners until all the local regulations were revoked in 1937.

The continued indifference of some flock-owners resulted in a clause being inserted in the Sheep Scab Order of 1923 to the effect that a person possessing or selling affected sheep should be liable to heavy penalty unless he could show that he habitually took proper measures to control and prevent the disease in his sheep. The results were unexpected, for it became apparent that fear of prosecution, if disease was confirmed in their flocks, was deterring owners from reporting and was thus contributing to the persistence of scab. The Order was therefore revoked in 1926.

By 1928 the position in Scotland was encouraging but there was no improvement in the over-all position in England and Wales. Indeed, the number of confirmed cases showed a tendency to rise, whilst the annual total of counties affected remained at around seventy. There were indications of lack of co-operation on the part of some sheep-owners and local authorities, especially in North Wales where six counties were responsible for one-third of the annual incidence of disease. The Ministry issued an urgent appeal to all local authorities and agricultural bodies to make the utmost effort to secure effective application of the dipping regulations and especially to try to arouse some enthusiasm among farmers to eradicate the disease. The response was heartening, particularly in lowland areas, for in the period 1928-32 the average number of affected counties fell from seventy to forty. The number of counties affected did not again exceed forty-two in any year before eradication was achieved.

1933 saw the beginning of a new and final phase in the campaign against sheep scab. In that year many moorland flocks grazing the Pennine Range were found to be very heavily infested. Inspectors of the Ministry on duty during a double dipping period

discovered unreported disease in moorland flocks from the Peak District to Cumberland. Some local authorities in this region had been rather perfunctory in their application of the regulations, and the manner in which the statutory dippings were conducted revealed many unsatisfactory features. At a meeting between the Ministry and representatives of the counties concerned it was agreed that the various local authorities would arrange regular veterinary inspections of all sheep on moor grazings, would appoint patrol shepherds to supervise sheep gatherings, and would generally endeavour to improve the rather primitive facilities available for dipping moorland sheep. Other duties permitting, Ministry inspectors would be detailed to assist in flock inspections.

Two main problems had to be overcome; the large number of owners sharing common grazings, and the indifference of some owners to a disease which, to them, was an accepted hazard of husbandry. Special movement area and double dipping Orders were declared. These introduced a new approach to the problem in prescribing double dipping of sheep during the winter months. The effects of this new campaign were soon apparent. Improved gatherings, regular summer, autumn and winter inspections of flocks and close supervision of the equally regular dippings combined to ensure that no pockets of infestation remained long undiscovered. Outbreaks in the Pennine Range area fell rapidly from a peak of 401 in 1934 to 59 in 1936.

In 1933 the position in North Wales was very akin to that in the Pennines, with a history of old-standing infestation and similar problems of common grazings, some unco-operative owners and primitive dipping facilities. Patrol shepherds had been employed by the Welsh counties for many years; indeed the first were appointed in South Wales as early as 1907. Subsequent action was identical to that in the Pennine Range. In both areas an intensive programme of inspection and double dipping of all moorland flocks was pursued for the next twenty years. After the transfer of functions from local authorities to the Ministry on 1 April 1938 all inspections were done by Ministry veterinary staff, whilst the local authorities remained primarily responsible for supervising the statutory dippings. 'Tail scab' was a constant feature of the disease in moorland sheep, and close inspection, with individual handling of every sheep, was necessary—an arduous task at any time, and especially so in upland areas in the winter months. The campaign was pursued as vigorously as conditions would permit right through the difficult years of the Second World War.

The sheep scab acarus proved hard to eliminate. It was 1946 before the total number of affected flocks in the Pennine and Welsh mountain areas fell below one hundred. In 1948 it was under seventy. Thereafter numbers fell rapidly and the last pockets of infestation in both areas were finally eliminated in 1951.

The progress of eradication in the rest of England had been more rapid. By 1938 the only serious residual infestation, apart from the Pennine Range flocks, was in the long-wooled heavy breeds in Lincoln and the East Riding of Yorkshire. Both these counties

were cleared by 1945, after which all outbreaks in England were in Pennine Range flocks or in sheep sold from these flocks or from the Welsh mountain area.

Eradication in Scotland proceeded at a quicker tempo. On the mainland the general high standard of shepherding of hill flocks, and the relative absence of common grazings, ensured effective gatherings and dippings so that by the middle 1920's outbreaks were becoming sporadic. By 1933 scab was thought to have been eliminated from the mainland except for cases in sheep emanating from the Hebrides and northern England, but a pocket of infestation was discovered in 1934 in the Loch Lomond area which persisted until 1938. Apart from a single outbreak in purchased sheep in 1941 this was the last mainland occurrence in Scotland.

The crofting areas of the Hebrides posed their own peculiar problems. There the keeping of sheep was a haphazard business. Grazings were all held in common. There was little understanding of sheep husbandry, no attempt at shepherding and, in the absence of boundary fences, sheep strayed freely. Dipping facilities were really primitive. This was the picture presented to the inspectors of the Ministry at their first visits to the Hebrides in 1920. Their subsequent exertions to provide baths, organise gatherings, carry out inspections and supervise dippings over a series of scattered islands is a saga in itself. Weather conditions were against effective dipping; one inspector reported seven dry days in six weeks; another, not one dry day in thirty. The Inner Hebrides were freed of infestation in 1927, but the Outer Hebrides proved more obdurate and another fourteen years were to elapse before eradication was completed by the elimination of disease from the island of South Uist.

The last outbreak in Britain was a single case in Herefordshire, early in 1952, the origin of which was attributed to a chance contact in Hereford market the previous autumn at a time when there were several outbreaks in that county.

There has been no recurrence of sheep scab since 1952. The possibility of re-introduction of disease by Irish sheep is still real, though diminishing each year as the position in Ireland improves. Dipping of all store sheep from Ireland at the ports of entry in the modern single-dipping type dips has proved to be an effective safeguard to our resident flocks.

Until 1948 all dips approved by the Ministry were based on arsenic, tar acids, nicotine or lime and sulphur. In that year, new single-dipping type dips based on a benzene-hexachloride content were approved for statutory dippings. These were a tremendous improvement on the earlier types because residues retained in the fibres of the fleece after dipping remained effective against acari for some weeks.

Had these dips been available earlier the long campaign against scab in moorland flocks would undoubtedly have been shortened. In the event the new dips played a relatively minor part in the eradication of the disease, though they did hasten completion of the final phase of the operation.

In retrospect the campaign against sheep scab can be divided into four distinct phases. First the period to 1903 when agricultural opinion was slowly being conditioned to the view that sheep scab, a universal affliction of the national flock, could actually be eradicated. Second were the years of national single dipping from 1905 to 1920, largely an ineffective phase since the method was based on the erroneous conclusion of the Departmental Committee of 1904 that one dipping would normally kill scab. The third period was from 1920 to 1933 when routine double dipping cleared disease from the greater part of the resident flocks in lowland counties. The fourth and final phase was the period 1933-52 when repeated flock inspections, combined with regular and especially with winter dippings, ultimately won what had become a war of attrition in the Hebrides and the mountain regions of Wales and northern England.

SWINE FEVER

SWINE FEVER was not recognised in Great Britain as a specific disease until 1862 when Professor Simonds, of the Royal Veterinary College, London, described a serious condition involving the intestines of swine in Berkshire. This was similar to the disease now known as swine fever. Professor William Duguid in his evidence before the Departmental Committee on Swine Fever in 1893 stated that in 1864 several outbreaks of swine fever were recorded in Berkshire, Wiltshire, and in parts of the west of England.

The first recorded reference to the disease in this country appears in *The Veterinarian* when Professor Varnall reported in 1864 on an outbreak of intestinal disease in pigs in the practice of J. D. Peach of Wentworth. The description of symptoms and of post-mortem appearance is so vague that this disease might have been swine fever, swine erysipelas or even non-specific intestinal disease. In *The Veterinary Review* of 1864 there is a short account by Professor A. J. Murray of the Royal Agricultural College, Cirencester, of a single case of typhoid fever in a pig. The description of the post-mortem findings here suggests swine fever. Professor Murray referred to the fact that pig pathology might almost be regarded as *terra incognita*, which emphasises the scant information available at that time.

The first classical report and description of the disease appears in the *Journal of the Royal Agricultural Society of England* in 1865. Dr. W. Budd of Clifton, Bristol, had delivered a lecture before the weekly council of the Royal Agricultural Society on *Typhoid Fever in Pigs*. The outbreak was at Clifton workhouse amongst pigs which had been purchased in Bristol market about a week before being taken ill. His report and its illustrations would be accepted today as a record of swine fever. Although he could not have had any knowledge of the cause of the disease his description of the pathology was superb. Budd stated that the disease had been the cause of enormous

mortality amongst pigs in various parts of the Kingdom, and that Professor John Gamgee of the Veterinary College, Edinburgh, was responsible for his first acquaintance with it: in August 1864 Gamgee had written him a short note to say that a very remarkable and fatal outbreak of typhoid fever had occurred amongst pigs in Edinburgh.

The place of swine fever in the history of regulatory veterinary medicine is clearly shown by its importance in the development of the control of notifiable diseases in the United States of America. In 1860 the Agricultural Division of the Patent Office first reported the prevalence of hog cholera (swine fever) which was apparently responsible for the setting up of the United States Department of Agriculture two years later—a matter of considerable interest since cattle plague had a very similar effect in Great Britain. It is clear that the disease was first reported in Ohio in 1833 but it may have been introduced earlier, to claim attention only when railroad transport began to operate and allowed it to spread.

Claims are made that the disease spread to the old world from the new and, with equal confidence, the reverse is postulated. This controversy is unlikely to be settled for the lack of a precise method of diagnosis in the early nineteenth century confuses the issue. The disease continues to be responsible for heavy economic losses to the pig industry on both sides of the Atlantic.

Before 1878 swine fever was allowed to spread in Great Britain unchecked by any regulations. After the passing of the Contagious Diseases (Animals) Act in 1878 several local authorities urged upon the Privy Council the importance of including swine fever in the definition of disease under the provisions of that Act. The Typhoid Fever of Swine Order 1878 was accordingly made, making the disease notifiable and providing for slaughter of diseased swine by the local authority who had also discretionary power to slaughter contact animals. The Order further provided that 'no swine shall be moved out of a pigsty, shed, or other place where typhoid fever exists, or has within six days existed, except for the purpose of being slaughtered, and with a licence of the Local Authority'. This Order was revoked and replaced the following year by the Swine Fever Order of 1879.

From 1878 to 1892 various measures for the suppression of swine fever were adopted by the local authorities under the Orders of the Privy Council and the Board of Agriculture but, although they included the slaughter of diseased swine and their contacts, the regulation of sales in markets and the prohibition of movement of swine into certain districts, they failed to produce any marked effect upon the incidence of the disease.

There was, in fact, a reduction in the number of cases of the disease in 1892, but this was partly because there were fewer pigs in the country. Furthermore, some local authorities had stopped compensation and so pig owners neglected to report the disease. There was no uniformity of action by local authorities; those who were active were

discouraged by repeated introduction of disease into their districts from areas where restrictions were lax and slaughter not adopted. As a result they, in turn, discontinued their measures of repression.

In 1893 a departmental committee under the chairmanship of Lord Edmond Fitzmaurice was set up with the following terms of reference:

To enquire into the working of the provisions of the Contagious Diseases (Animals) Act in so far as they relate to swine fever, and having regard to the nature of that disease, and to the conditions under which swine are infected therewith, to consider whether any more effective measures can be adopted for its prevention and extirpation.

As a result of the Committee's recommendations the Board of Agriculture took over responsibility in 1894 for a policy of slaughter of ailing pigs on all premises where the disease was declared to exist, and also of the pigs in close contact if they had been exposed to infection. Ailing pigs were examined on the premises and laboratory examination of viscera of pigs slaughtered was made before the disease was confirmed.

The report of the Chief Veterinary Officer for 1894 referred to the probability that the 1893 Departmental Committee, when recommending that the Board of Agriculture should assume responsibility for stamping-out swine fever, had in mind the success in eradicating pleuro-pneumonia. In his Report the totally different nature of the pathology is pointed out and the fact that, although swine fever had always, since its recognition, been regarded as 'an affection in which the intestinal track [sic] has been especially implicated', disease was frequently reported in the lungs. The lesions of the disease are described in detail and the importance of haemorrhage in the diagnosis is pointed out for the first time. It is recorded that the disease may be acute and fatal, or chronic and mild, with many pigs recovering and a large proportion remaining in perfect health. The importance of spread through markets is emphasised and the widely scattered distribution recorded.

Generally, the lack of success of the policy was attributed to the obscure character of the disease which might remain in a herd for months without detection and in some instances be diagnosed only with great difficulty. Pig owners, breeders and the authorities of infected districts had not given the assistance they had promised. Until owners would consent to closure of markets and would accept some interference with trade, and until local authorities would give active co-operation, there was little hope of success.

In 1894 the Infected Areas Order and the Markets and Fairs (Swine Fever) Order were put into operation, but in spite of these measures the number of outbreaks continued to increase. In July of that year the Swine Fever Order 1893 was reviewed and a new Order substituted which confined slaughter to those pigs which appeared to be diseased, and which were required for purposes of diagnosis.

Another committee was set up in 1895 to conduct an enquiry into the etiology, pathology and morbid anatomy of swine fever, and report the result to the Board of Agriculture. By 1897 it had reported on the existence of swine erysipelas but, beyond a review of the foreign literature, little headway was made in relation to swine fever. Besides experiments at the Royal Veterinary College and at Harrow-on-the-Hill much work was at that time being carried out in the United States of America, Germany and France.

Little or no progress was made in the control of the disease although in 1896 the Board reverted to the policy of general slaughter that had been in force up to 1893. A modified Infected Areas Order 1896 and a Zones Order 1896 were also passed but the latter was only enforced for a short period. This year there were 5,166 confirmed cases and no doubt this led to the following statement in the Annual Report:

It was not until November, 1893 that at the urgent request of agriculturists the Board of Agriculture was called upon to make an attempt to stamp out the disease. No duty so difficult or troublesome had ever been imposed upon the Veterinary Department since it was created in 1865 for the purpose of stamping out cattle plague. This is evidenced by the fact that swine fever has never yet been eradicated from any country where it has once obtained a good foothold.

It is clear that it was fully appreciated that strict control of the movement of swine was essential and that this must include restrictions on the aggregation of pigs in markets and sales. However, it is equally obvious that there was a continuing battle to achieve a sufficient degree of control of movements, which was influenced largely by inconsistency in the work of local authorities and resentment on the part of pig owners, dealers and market authorities of the restraints which must accompany adequate regulations. There was a question whether, in fact, the restrictions that must be accepted to achieve eradication would not impose a greater burden on the pig industry than the disease itself.

There is therefore a tale of changes in legislation and procedure depending not only on the advance of knowledge of the disease but also upon the current attitude to it.

Regulations which appeared to be effective were in some cases withdrawn or modified. One such was the Markets and Fairs (Swine Fever) Order 1896 which was replaced by the less severe Swine Fever Movement Order 1898, which was in turn withdrawn in 1899. The Report of the Board for that year stated:

The imposition of severe restrictions on movement in limited areas combined with slaughter of diseased and contact pigs has almost invariably been followed by good results, and, if the owners and dealers in pigs would but unite in a body and submit to a general stoppage of movement, except for slaughter or breeding purposes, throughout the whole of the country for a period of twelve months, there is little doubt that the disease would, at the end of that time, be greatly reduced in most and entirely eradicated in some of the Counties in Great Britain.

The slaughter policy was again modified in 1900 and reverted to slaughtering only those pigs which appeared to be diseased or which were required for diagnostic purposes. Apparently the slaughter policy was regarded as valueless and futile. It was alleged that, in order to obtain payment due to them from pig owners, it was in the interests of dealers to spread the disease amongst the stock of their poorer clients. A passage in the Annual Report for 1900 ran:

A dealer's only chance of recovering the money due to him would be to know that on or about a certain date, the debtor would be in receipt of a certain amount of ready money, and to press him for payment about that time. The distribution of suspected swine among such clients would, if slaughter and compensation were generally resorted to, afford the dealer a better chance of recovering the money owed to him than might otherwise be the case.

As a result veterinary inspectors were instructed in some cases to refrain from slaughter. Clearly no slaughter policy could make headway in such circumstances.

The Swine Fever Order 1901 was made requiring the cleansing and disinfection of dealers' carts and premises. Reference was made in the Report for 1901 to the introduction of the disease possibly being caused by swill, but this suggestion was not accepted and it was recorded that

... a much more feasible explanation of these unaccountable outbreaks is that, although the owner is unaware of it, his pigs have been infected by some indirect means, and that they would have fallen with swine fever even if they had not been fed upon foreign food-stuffs or swill.

It is of interest to speculate how control would have progressed had swill been accepted at this time as a source of infection from abroad and a method of spreading infection at home.

Although the Second Progress Report of the Research Committee on Foot-and-Mouth Disease (1927) had clearly shown that the virus of foot-and-mouth disease could survive in carcase meat, it was not until 1933 that Doyle showed that the virus of swine fever survived for 73 days (not the end point) in the bone marrow of salted and chilled carcasses, and even for 90 days in the skin of smoked carcasses; whilst Edgar, Hart and Hayston showed that in frozen pork (refrigeration at 12°F) the virus was still active and capable of infecting pigs after 1,598 days; in bacon it was viable for 27 days. These findings clearly demonstrated two facts. Swill feeding was a source of recurring outbreaks, and this swill was derived from infected pigs slaughtered in the incubative stage of the disease and subsequently used for human food.

Model regulations, adopted by some local authorities in 1902, were framed to prevent introduction of disease into their areas as well as to control its spread inside them. Next year, in a downward trend of outbreaks, the Regulation of Movement Order of 1903 was passed and it was applied to districts which had not adopted the model regulations nor made satisfactory provisions for that purpose. This brought a further

reduction in incidence. In this year, too, the movement of store pigs from Ireland was prohibited.

In 1905, with the lowest number of outbreaks (817) so far reached since the disease was dealt with by the Board, all existing regulations made by local authorities were revoked and the Swine Fever (Regulation of Movement) Order of 1903 was applied with a view to inaugurating a policy of grouping counties so as to enlarge the areas of free movement. This alteration, and the removal of the complete ban on importation of store pigs from Ireland, led to another increase in outbreaks, and in 1906 comment was made in the Report to the effect that:

Swine fever may exist for a long time in so mild a form that it escapes observation; the existence of the disease is being concealed by purpose or carelessness; the common methods of post-mortem diagnosis are faulty, and result in some premises upon which deaths have occurred being freed, although swine fever really exists thereon; some indirect method of infection, of which we have no knowledge, is also in operation; in the process of slaughtering out swine on an infected place one may meet with distinct lesions in animals which during life appeared fat and healthy.

Two American chemists, Alexander de Schweinitz and Marion Dorset, succeeded in separating the virus from the *Bacillus cholera suis* which, until the publication of their work in 1903 and 1904, had been accepted as the cause of swine fever.

They reported their epoch-making findings with considerable caution with these words:

There is an infectious disease amongst hogs in this country which cannot be distinguished clinically from hog cholera, and which may be reproduced by infecting with material which contains no hog cholera bacilli.

It is worth quoting verbatim from Stockman's Report for 1907 in view of its reference to present-day experience. He wrote:

Another point which has been seriously engaging my attention is, that we not infrequently find that young pigs born from sows which there is strong reason to believe had recovered from Swine-Fever some months before, succumb to the disease. Such sows have been on several occasions slaughtered for purposes of investigation, and no trace of a Swine-Fever lesion could be found. The bowel lesions found in these very young pigs are often by no means typical, according to the generally accepted and classical description, but I have several times been able to convince myself by the finding of typical lesions and by the inoculation test with blood, that the mortality amongst the very young pigs was due to Swine-Fever. One question which arises out of this observation is 'do pigs which have completely recovered from Swine-Fever sometimes excrete the virus from their bowels, and remain infective to other pigs for any considerable time?'

Following this observation the procedure was again changed. In 1908 the Board decided to purchase and slaughter all breeding stock on infected places as well as sick

pigs and those in close contact. Some carcasses were salvaged for food. The viscera were removed from infected pigs and, without post-mortem examination, the carcasses were sent to abattoirs where meat inspection was carried out. It is noteworthy that the net cost of compensation to farmers from 1894 to 1915 was over £1 million after taking account of £800,000 received for salvaged carcasses: a very extensive amount of salvage was obviously being done.

The system was not abandoned until after the outbreak of the First World War.

At that time much less was known about the spread of virus infections. It is now recognised that salvage of carcasses from infected premises must result in a great risk of spread of infection. It was not then appreciated how widely virus might be distributed on an infected place, nor that confining slaughter to ailing pigs and their immediate contacts could not stamp out the disease. Besides, such regulations as existed for movement control were not enforced as, for instance, those introduced in 1908, when the local authorities were not co-operative.

In 1910 a departmental committee under the chairmanship of G. L. Courthope, was appointed 'to enquire into the cause of the continued prevalence of swine fever in Great Britain and to report whether it is practicable to adopt any further measures with a view to securing its speedy extirpation.'

The Committee issued an interim report the following year recommending that all pigs known to have been exposed to infection should be slaughtered with the payment of compensation. This was put into effect in selected areas but had little effect. In 1915, therefore, the Committee came to these conclusions: the continued prevalence of swine fever appeared to be due principally to its highly contagious character and the difficulty of its recognition by the pig owner in its early stages and in its milder forms; it was very difficult to trace the origin and movements of pigs which had spread the disease; the elimination of the disease was practicable only by such a drastic exercise of powers of slaughter as would involve a prohibitive outlay, and by such severe restrictions of movement as would be fatal to the pig industry.

It recommended that the attempt to eradicate the disease by slaughter of affected pigs and close contacts should be abandoned; the objects of future policy should be to reduce mortality from the disease and to control its spread; the use of serum in infected herds should be encouraged; the serum/virus method of conferring immunity should be employed whenever the pig owners so desired; the isolation of infected premises should be maintained by regulation; restrictions on pig movements should be relaxed.

The Committee was impressed by the possibility of the development of vaccination as a method of control. It also recognised the advantages that would accrue from the discovery of a reliable diagnostic test and it recommended that work to these ends should be continued.

These recommendations were adopted: the procedure was modified, and the slaughter of affected pigs was virtually stopped. From 1916, infected herds were either slaughtered voluntarily by the owner (and this did not commonly happen) or they were isolated until there was no longer any clinical evidence of disease. The only pigs slaughtered by the Ministry during this period were those which it was considered necessary to kill for diagnostic purposes.

For a short period, from September 1915 to June 1916, pigs obviously sick from swine fever were slaughtered and serum was provided free of charge for the remaining pigs on infected places. Free serum treatment was continued, after slaughter had ceased, until 1922 when it was stopped because it had been found that the disease was usually well established before it was suspected, and therefore many of the apparently healthy pigs were already infected and acquired no protection from the serum. From 1922 until the introduction of the slaughter policy in 1963 advice was given on the advantages and disadvantages of the use of serum and its use was left to the discretion of private veterinary surgeons.

The reduction of outbreaks (2,104 in 1917, and 1,407 in 1918), although partly due to the use of serum, may have been influenced by the curtailment of the traffic in pigs during the war. A significant increase in incidence in 1919, when there were 2,177 outbreaks, coincided with the progress of demobilisation of troops. The numbers of pig-keepers increased as returning soldiers resumed or took up pig-keeping, often on a small scale. At the same time the supply of foodstuffs improved to encourage a wide resumption of back-yard pig-keeping and, most importantly, with the increased demand for pigs, there were many more pig-dealers.

Great Britain had been divided into scheduled areas for the purposes of the Swine Fever (Regulation of Movement) Order of 1908. Movement of pigs between the areas was controlled by licence so that only fat pigs for slaughter could be brought from one scheduled area to a market or sale in another area. Licences were granted for the movement of pigs which had been on the premises for twenty-eight days, stipulating that they must be detained at their destination for a similar period. In 1908 there were as many as fifty-eight scheduled areas, but the number was gradually reduced by extension and amalgamation until from 1917 onwards there were thirteen.

It had been apparent for some considerable time that this system did not prevent the spread of swine fever. The Regulation of Movement of Swine Order of 1922 applied modified movement restrictions to a single scheduled area which included the parts of the country in which swine fever was normally most prevalent. Outside this area the only general movement control was applied to pigs which had been moved under licence from the area. For the first time restrictions were imposed on the movement of pigs from the premises of pig dealers and it was stated in the Report for 1922 that: 'The new Order has been well received. At no time during the past twenty years has

the movement of pigs generally in Great Britain been subject to such a simple method of control as now obtains.' This Order was the basis of the control measures with minor adjustments until 1950.

In 1949 there were only five outbreaks, the latest of which occurred in March. This favourable situation probably came about because of restricted imports of foreign pig meat and a much reduced pig population. The scheduled area, which had been amended as the development of disease demanded, was removed entirely on 1 February 1950. Almost immediately afterwards, however, there were widespread outbreaks throughout England and Scotland, 'revealing once more the importance of the pig dealer as an agent in spreading swine fever'. The system of movement control and detention was accordingly reimposed by the Regulation of Movement of Swine Order of 6 August 1950. This was revoked in 1954 when, with the return of free marketing, a new Order came into force which abandoned the concept of the scheduled area but continued to ensure that no sale of swine should be made in any market, fairground or saleyard unless authorised by the local authority, and that the movement of pigs from markets and the premises of dealers was controlled by licence, thus enabling the tracing of movement of pigs in connection with outbreaks. This Order, which was amended in 1955, was finally revoked by the Regulation of Movement of Swine Order 1959 which consolidated and amended the previous Orders and which remains in force today.

Apart from general movement controls, much more extensive and severe restrictions of movement, imposed under the Swine Fever (Infected Areas Restrictions) Order of 1956, may be applied over a particular area where swine fever has become widespread or when, for example, the disease has been disseminated through a market. Store markets are prohibited in the infected area and it has been the general experience that this is a particularly valuable adjunct to disease control. Before 1956 it had been necessary to prepare detailed infected areas restrictions Orders on each occasion on which they were required. The 1956 Order enables short special Orders to be made declaring infected areas under the provisions of the main Order.

Vaccines against swine fever were developed following Dorset's original work with crystal violet as an inactivating agent. After further progress made in the USA, this vaccine came under trial in Great Britain. In May 1947 it was decided to permit its use and a production unit was established at Weybridge. There was little demand for it at first, largely because of the marked reduction of outbreaks at this time.

With the object of increasing the number of breeding pigs immune to swine fever, and to provide protected store pigs to meet the needs of rearers and feeders, the Swine Fever Registered Vaccinated Herds Scheme was introduced at the end of 1953 in co-operation with the British Veterinary Association and the National Farmers' Unions. The scheme laid down the conditions of vaccination, and a fixed charge which the veterinary surgeon could make to his client. Participation in the scheme was initially

confined to breeders. At no time did it have whole-hearted support from the industry or the veterinary profession. Nevertheless the scheme continued in force in a revised form even after the slaughter policy was re-introduced. Various attempts were made from time to time to increase the use of crystal violet vaccination and a number of unofficial county schemes came into operation from 1960 to 1962. These schemes which were, in the main, introduced as a result of agreement reached between veterinary surgeons, auctioneers and county branches of the NFU, were largely concerned with the establishment of pig sales at markets under prescribed conditions so that farmers could be assured at the time of sale of a substantial degree of immunity from swine fever in pigs purchased in such auctions. The schemes met with varied success.

Live vaccines were also studied and a vaccine was developed in which the virus was attenuated by passage through rabbits. This lapinised vaccine reached the stage of field trials but never came into general use. It was found to be reasonably safe but, while there was an overall death rate of some 2 per cent of pigs, serious losses occurred among younger pigs in herds kept under poor conditions. Because of this, and the fact that vaccination with a live virus might interfere with new methods of diagnosis, it was discarded.

Diagnosis of swine fever has always been very difficult. For many years dependence was placed upon post-mortem lesions considered along with the clinical syndrome and the history in the herd. At one time great emphasis was placed on the lesions seen in the bowels and notably on the so-called button ulcer. Later, however, the greater significance of petechial haemorrhages, and lesions in the kidneys, urinary bladder and lymph nodes was appreciated.

Two outstanding advances in the diagnosis of the disease were made in 1957. The first derived from work done in Germany in 1931 on neuro-pathological examination of the brain. Experimental and field investigation by workers at Weybridge showed that, in Great Britain, diagnostic lesions of the disease could be expected to be present in the brains of 90 per cent of pigs which died of classical swine fever. Under conditions obtaining in this country these lesions were not likely to be confused with those found in other nervous diseases of pigs. Secondly, the gel-diffusion test of Ouchterlony was successfully applied to reveal the presence of the specific antigen, pancreas being the best material for this test. This test is only of value after clinical symptoms have been in evidence for a minimum of five days; nevertheless it has been found valuable in conjunction with the brain lesions in the differential diagnosis of swine fever. Further study of laboratory diagnostic methods continues, including the use of a fluorescent antibody technique which is being developed in collaboration with American workers.

Before 1 January 1962 diagnosis of swine fever was confirmed only after the examination of lesions in specimens submitted by veterinary officers to Weybridge. Arrangements for de-centralised diagnosis were introduced at this time and since then disease

has been confirmed on receipt of satisfactory evidence passed to Head Office by telephone from whole-time veterinary officers. Specimens are submitted in inconclusive cases for serological and histological laboratory examination. Thus there was more than a year's experience of these diagnostic arrangements before the slaughter policy started in 1963, and this proved of great benefit.

When a study was made in 1957 of the tasks to be undertaken after the plan for eradication of bovine tuberculosis was completed, swine fever was placed high on the list of those diseases that might be dealt with and it was thought possible to eradicate it. In 1960 the Ministry decided to carry out a slaughter policy, with approval of the continued use of crystal violet vaccine at the commencement, with slaughter of all pigs on affected premises and with destruction of all carcasses without salvage.

The stamping-out policy began on 11 March 1963 at which date there were 267 herds already under restrictions because swine fever had been confirmed in them during the previous fifty-six days. However, in view of the incubation period, it was decided that only those herds in which disease had been confirmed or re-confirmed during the preceding twenty-eight days should be slaughtered.

During the first twelve months of the eradication campaign, disease was confirmed in 1,304 herds; a total of 282,250 pigs, including dangerous contacts, were slaughtered, and approximately £3,844,000 was paid in compensation. During the eradication period there has been a steady decline in the number of outbreaks confirmed. Naturally, fluctuations in incidence have occurred and can be expected as a result of spread through markets or from private sales. Nevertheless, satisfactory progress has been made.

Infected area restrictions are still of great value in reducing the incidence of the disease, especially if they are maintained for considerable periods. More recently they have been used when markets have been involved, and in such cases they are maintained only until tracings have been completed.

Since 1963 it has become quite clear that animals infected in pregnancy and surviving an attack of swine fever can carry infection, giving rise to subsequent outbreaks of disease by virus shed at parturition. This fact confirms earlier suspicion.

Swill will remain a source of infection so long as pigs are sold for slaughter before their herd of origin comes under suspicion but as eradication proceeds this hazard is diminishing.

It had been anticipated that as the eradication campaign progressed the use of crystal violet vaccine would have to be reviewed. The use of the vaccine can hinder the early recognition and elimination of infected herds, and once the bulk of infection in the country had been eliminated the value of vaccination to individual owners was no longer considered to outweigh the disadvantage which it represented to the national programme of eradication. This stage was reached in the early summer of 1964 and the supply of vaccine was accordingly discontinued as from 10 August of that year.

At the same time the Registered Vaccinated Herds Scheme was brought to an end.

It was realised that the withdrawal of vaccine might bring to light clinical disease which had been suppressed by its use. However, eradication is more likely to be complete under circumstances which do not discourage the evidence of frank disease.

The 1896 Report states: 'No duty so difficult or troublesome had ever been imposed upon the Veterinary Department since it was created in 1865 for the purpose of stamping out cattle plague.'

With this thought in mind the present eradication policy must continue fortified with a better knowledge of the virology and pathology of the disease and with the measure of success so far obtained. Time alone will show how long the task will take.

ATROPHIC RHINITIS

ATROPHIC RHINITIS in pigs had not been recorded as such in Great Britain until March 1954 when its existence was confirmed in a young boar, the progeny of an apparently healthy Landrace gilt which had been imported from Sweden in the previous September. In the belief that a new disease had been brought to the country and that radical measures at an early stage might eliminate it, the disease was made notifiable and a slaughter policy was introduced.

The Swedes challenged the opinion that infection had been imported from their country and claimed that it already existed in Great Britain unrecorded. A survey made in conjunction with a Swedish veterinarian at an English bacon factory demonstrated some abnormality and deformity of snouts but no evidence of an infective condition was found in the supplying herds and the difference of opinion remained unresolved. During a period of six years, forty cases were confirmed of which twenty-nine were linked with Swedish importations into England, the Isle of Man and Jersey during 1953, and nine other cases occurred in the Landrace breed; the remaining two cases were in Wessex cross-bred pigs.

Surveys undertaken up to October 1957 showed that a rhinitic condition was fairly widespread throughout Great Britain, nearly 60 per cent of the snouts examined showing some abnormality of the nasal structures. Only about one per cent of these showed definite atrophy as compared with about 14 per cent of the snouts of pigs which were dealt with under the Atrophic Rhinitis Order 1954. The disease found in Swedish pigs may have been a different entity from that existing in this country or, alternatively, the symptoms observed in the early cases may have been due to some intercurrent infection not directly associated with the bone degeneration.

The symptoms of the disease are sneezing, haemorrhage from one or both nostrils,

distortion of the snout, conjunctivitis, unthriftiness and emaciation spreading insidiously through litters and herds. Post-mortem examination reveals changes in the anatomical structure of the bones in the snout varying from slight damage to complete destruction of the turbinate bones. Diagnosis of such frank disease did not present any major difficulties during the first few years after the slaughter policy was introduced. From 1958 to 1961, however, the clinical signs observable in the earlier cases were not so marked and diagnosis became more difficult, only eight cases being confirmed, five of which were in 1958. In 81 other suspected cases 51 of 153 snouts examined showed varying degrees of atrophy, but there was no evidence of a spreading infection, disease was not confirmed and no serious consequences ensued.

Experience by then had shown that the disease seldom gave rise to obvious abnormalities or had any significant effect on growth or food conversion rates and was not of such economic importance as was at first feared. Diagnosis had become extremely difficult and it was felt that, as a reasonable measure of control could be maintained without serious loss to the farmer by ordinary intelligent culling, control by slaughter was no longer justified. In November 1962 the disease was therefore removed from the list of diseases for which a slaughter policy is enforced and ceased to be a notifiable disease under the Diseases of Animals Act of 1950.

FOWL PEST

FOWL PEST is a term used in legislation to cover two diseases of poultry, fowl plague and Newcastle disease. The viruses belong to the influenza or myxovirus group of viruses, but are serologically and immunologically quite distinct.

FOWL PLAGUE

Fowl plague (variously known in different countries as fowl pest, peste aviare, pestis avium and geflugel pest) is an acute, highly infectious disease and is generally fatal to poultry. Fowls and turkeys are most commonly affected but many species of wild birds are susceptible. The disease is characterised by a high mortality following a relatively short period of fever with dullness, inappetence, cyanosis and, frequently, swelling of the head. It was first described in Italy in 1878 and the cause was demonstrated in 1900.

Fowl plague was first recorded in Britain in 1922 when it did not become established and since then the disease has only been encountered on one occasion when outbreaks were confirmed in two turkey flocks in Norfolk in May and June 1963.

In the Norfolk cases the birds exhibited marked dullness, became comatosed and died within twenty-four to thirty-six hours of the onset of symptoms. The mortality rate was high but the spread of the disease on the infected premises was slow. Despite

extensive investigation the origin of the infection was not discovered. It is probable that the second outbreak was caused by infection carried from the first by indirect means, possibly on the clothes of a lorry driver.

All the affected birds and any which could have been exposed to infection on both premises were destroyed, as were hatching eggs which might have been infected, and the disease was very quickly eradicated. This success may have been due in some measure to the particular virus involved which showed but little tendency to spread.

NEWCASTLE DISEASE

A new disease of poultry showing marked respiratory symptoms and a very heavy mortality was seen in 1926 in the Dutch East Indies where it was reported that more than 2 million birds died. In the same year Doyle from Weybridge investigated an outbreak of disease at Newcastle-upon-Tyne in which all the birds died. He recovered a virus and named it Newcastle disease virus. It was distinguishable at this time from fowl plague by pigeon inoculation; pigeons being susceptible to Newcastle disease but resistant to fowl plague. Serological tests are now available to distinguish quickly between the diseases.

There are at least fifteen pseudonyms for Newcastle disease, amongst these being pseudo fowl pest, pseudo vogel pest, pseudo poultry plague, avian pest, Ranikhet and avian pneumo-encephalitis.

Newcastle disease is infectious and highly contagious and chiefly affects fowls and turkeys. In fowls the disease may be of the peracute (Asiatic) type or the acute, sub-acute or mild types, and may result in death from varying degrees of disturbance of the respiratory, nervous, digestive and reproductive systems.

The usual incubation period is about five or six days but may range from two to fifteen days. The first symptoms of disease in domestic fowls are dullness, greenish diarrhoea, loss of appetite and respiratory difficulties which are frequently followed, particularly in young birds, by nervous symptoms, depression and paralysis. In laying birds there is a dramatic drop in egg production accompanied by an abnormal proportion of soft-shelled eggs. Mortality varies widely, heavy mortality being most common in young stock.

In turkeys the symptoms are usually less apparent, although severe symptoms and heavy mortality may be seen in young poults. Infected adult turkeys may excrete the virus without showing symptoms, but in egg-laying adults there may be a marked interference with the reproductive system; egg production may cease or abnormal eggs, soft or imperfect with loss of shell pigment, may be laid. Ducks, geese, pigeons and some varieties of wild birds may contract Newcastle disease and excrete virus, but symptoms are not usually apparent and diagnosis is dependent on serological methods. Man is susceptible, the symptom being an acute conjunctivitis which, though painful

and inconvenient, clears up in a few days. Immunity to this conjunctivitis would seem to be of short duration. Various other mammals can be infected artificially by inoculation.

Peracute Newcastle Disease

Following the initial case in 1926 further outbreaks occurred in 1927, after which the disease apparently died out. This was greatly assisted by the very high mortality which accompanied infection. Although no origin was established for these outbreaks it seems probable the disease was introduced by infected food-refuse from a ship. A single case, also of the peracute type, occurred in England in 1933 involving a large flock in Hertfordshire. Some 10,000 birds died, and spread was prevented, apparently by the voluntary slaughter of survivors by the owners.

The country remained free from Newcastle disease until 1947 but meanwhile it was being recorded in different countries in the Far East and re-appeared in Europe during the Second World War, until very soon it was identified in almost every European country.

In the meantime the Minister of Agriculture and Fisheries was given power by the Diseases of Animals Act of 1935 to control contagious diseases of poultry. The Fowl Pest Order of 1936 was framed to enable speedy action to be taken against the only form of Newcastle disease then recognised (the peracute form) and fowl plague. These diseases became notifiable, the rules to be observed on the infected place were outlined, and the Minister was given authority to slaughter infected poultry and poultry exposed to infection—a course likely to be successful with such frank diseases. An owner was required to report any suspicion of fowl pest in his stock to the Director of the Central Veterinary Laboratory, Weybridge, and to send the carcass there for examination. Similar action was required of veterinary surgeons or veterinary inspectors of the Ministry or of a local authority.

In February 1947, within two weeks of the resumption of the importation of poultry carcasses from Poland and Hungary, disease was re-introduced. The first case occurred in Somerset. Spread was rapid and the strain of virus proved to be particularly virulent. The spread was largely aided by the use of swill and kitchen scraps by domestic poultry-keepers to supplement the meagre rations of poultry food. By the end of June, 542 cases were confirmed with 72 per cent in flocks belonging to domestic poultry-keepers. In one-third of the cases the origin of the infection was from unboiled swill and poultry waste. By the end of the year 2,222 outbreaks had been confirmed.

Consignments of imported carcasses were sampled and it was found that 6.9 per cent of goose, 11 per cent of duck, 24 per cent of turkey and up to 80 per cent of fowl carcasses were infected. Not only was this very important in connection with fowl pest but it was also the first time that the causal virus of a disease had ever been recovered

from any imported carcasses, although in 1926 lesions of foot-and-mouth disease had been found in some imported pig carcasses. Various changes in legislation had to be made to cope with this situation. In May 1947 the Order requiring the boiling of waste food was extended to include waste food fed to poultry and it became an offence to allow poultry to have access to swill that had not been boiled for one hour. Arrangements were made for the evisceration of poultry carcasses from Europe and distribution of these was confined to five large urban areas. Also, in May, in order to speed up procedure the responsibility for the diagnosis and confirmation of disease was transferred from Weybridge to the veterinary inspectorate by the Fowl Pest Amendment Order of 1947 (No. 2). In August the landing in Great Britain of live poultry and hatching eggs was prohibited with certain exceptions under the Poultry and Hatching Eggs (Importation) Order of 1947. In the same month an Order was made banning the movements of live poultry into Scotland and northern England from the rest of England and Wales. The gathering of stock from more than one source on to the premises of dealers was prohibited, and street markets were closed, for it had become obvious that dealers and street poultry markets had been heavily implicated in the spread of infection. These steps were effective in reducing the incidence of disease during 1948 when 267 outbreaks occurred, but in that year clinically healthy birds at a laying trial were found to be positive to the haemagglutination inhibition (H.I.) test¹ and tracing of these disclosed a low-grade infection in the brooders of a hatchery. This was the first indication that a less virulent virus was present in the country.

Of the 582 outbreaks which occurred in 1949, 203 were in the Scottish mainland and islands. The disease was first confirmed in two flocks in Orkney and then in Shetland, in the Inner and Outer Hebrides and in coastal areas of Argyll, Wigtown and Aberdeen, and on the Bass Rock in the Firth of Forth. The distribution of these outbreaks, and the fact that the coast of Northern Ireland was also involved, suggested the possibility that sea-birds, although themselves apparently healthy, were infective and capable of conveying disease to more highly susceptible domestic fowls. It is possible that infective material discharged from ships had been carried ashore by scavenging seagulls, or that dead fowls dumped in the sea following many of the outbreaks had provided a source of infection. However, it became clear that sea-birds were more than mechanical carriers of disease, for the Ministry's laboratories recovered virus from shags, cormorants and gannets although none of these birds showed any symptoms of disease. Although disease continued to occur in Scotland for nearly a year it was satisfactorily mastered by slaughter of infected flocks and safe disposal of carcasses.

¹ Haemagglutination inhibition, which is the most commonly used serological test for Newcastle disease, depends on the fact that antibodies present in the blood of infected birds inhibit the ability of Newcastle disease virus to agglutinate the red blood cells of healthy fowls. This laboratory test is a rapid and cheap method of testing birds, but it may not differentiate between a current active disease and previous exposure to infection.

In July 1949 veterinary officers of the Ministry visited Hungary and found that the custom of keeping birds alive for a final feeding period of a week at slaughter plants was allowing a considerable build-up of infection to develop, with the result that many infective birds in the pre-clinical or early clinical stages of the disease were being slaughtered for export. Arrangements were made with the Hungarian Government, and later with the Polish Government, to reduce the likelihood of infection being present in birds slaughtered for export to Great Britain.

In the first half of 1950 only seventy-eight outbreaks were confirmed in England and Wales, forty-four of these being in areas receiving imported poultry carcasses, and twenty-two in adjoining counties. The remaining twelve cases were in Cornwall and were associated with ships' swill from Falmouth. Apparently, therefore, the slaughter policy, together with the restrictions imposed on the movement of live birds, had brought the disease well under control apart from the introduction of disease in imported carcasses. The importation of uncooked poultry carcasses was therefore prohibited from countries where Newcastle disease was endemic, under the Poultry Carcasses (Importation) Order of 1950 and its amendments of 1951. It may seem extraordinary that such a long period elapsed before this step was taken but it must be remembered that it was thought that the importation of eviscerated—so-called oven-ready—carcasses would be a sufficient precaution and there was still a real shortage of food which made a complete ban on imports of carcasses unacceptable.

The salvage of apparently healthy carcasses from larger flocks, which had been necessary as a post-war measure, ceased in 1950 and a further possible source of infection was thus removed.

In 1950, of the 172 cases confirmed 68 per cent were classed as peracute disease. In 1951, only 28 (3·3 per cent) of the 844 cases confirmed were peracute and in 1953 only 6 (0·6 per cent) of a total of 978 cases were peracute, and these 6 were attributed to infected ships' swill. Peracute Newcastle disease has not since been recorded and the slaughter policy, together with the ancillary controls, had succeeded in stamping out this form of disease.

Acute and Subacute Newcastle Disease

As already mentioned, there was evidence in 1948 to suggest that a less virulent strain of virus was present in this country. However, it was not until the autumn of 1950 that the subacute disease assumed sudden and serious importance. In October, after five weeks without a case being confirmed, an outbreak occurred in West Suffolk which was characterised by less intense symptoms and a lower mortality. This was the first confirmation of the subacute type of infection, and the movement of poultry through dealers and markets gave rise to fifty-five outbreaks in East Anglia by the end of the year. The disease was characterised by a sudden drop in egg production, green

diarrhoea, slight respiratory involvement and a very low mortality. Because poultry-keepers did not suspect Newcastle disease there was delay in detection of outbreaks. Although the origin of the disease was not definitely established, the earliest cases were situated near the United States Air Force base at Mildenhall from which swill had been sold for animal feeding. However, in view of the incidence of this form of the disease in Europe it is possible that infection was introduced from the Continent.

Steps were taken to warn poultry-keepers of this new type of Newcastle disease, and the battle for eradication was joined against this much more insidious enemy. It had been established in 1944 that a disease which had been present in the United States for a number of years and was then known as pneumo-encephalitis was, in fact, caused by Newcastle disease virus, although the course of the disease was much milder than that of the 'Asiatic' type described by Doyle. It was this type of Newcastle disease which was encountered in Suffolk and which, with relatively short periods of freedom, has been present to a greater or lesser extent in the country ever since. The results obtained in the early years of the slaughter policy were not unsatisfactory or without encouragement that the policy would be successful. The disease was stamped out for long periods in many parts of the country and its spread to other parts prevented.

In more recent years it became clear that in certain heavily stocked areas, notably East Anglia and Lancashire, the eradication policy was proving costly and was not completely effective. There were several reasons for this. The disease was milder and sometimes almost sub-clinical forms occurred which resulted in delay or failure to report the suspicion of fowl pest. Disease in turkeys was usually sub-clinical and these birds acted as reservoirs of infection. Differential diagnosis became more onerous as the incidence of other respiratory infections increased, leading to further delays in reporting and, on occasions, difficulties in confirmation, although more than 80 per cent of cases were confirmed without recourse to laboratory assistance. Moreover, the pattern of the poultry industry had changed rapidly since the war and there had been a remarkable increase in the number of poultry kept in Britain. Between 1948 and 1962 the adult egg-producing fowl population increased from 40 millions to 70 millions; the broiler industry, non-existent before 1950, had developed to reach an annual turnover of around 150 million birds; and the turkey population, which was 0.8 million in 1947, had risen to 3.5 million.

This enormous rise in the poultry population has been accompanied by an increase in size of poultry units and the industry has turned over almost entirely to intensive methods of husbandry. Nor is this larger flock size limited to the new broiler units; egg-laying and breeding units have also greatly increased in size. More than 80 per cent of the country's chick requirements are produced by fewer than thirty breeders. Large unit size coupled with intensivism provide ideal conditions for the multiplication of virus within the flock and for spread from it. In some circumstances, as for example with

forced-draught ventilation, the potentiality for dissemination of virus becomes exaggerated. The integration of small concerns into large organisations or group systems has resulted in the development of common services, for example, food supplies, equipment and staff, which have led to disease being spread within the group. Deep-freeze storage has become a routine method of keeping poultry carcasses and provides ideal conditions for the preservation of Newcastle disease virus and maintenance of infection over long periods.

In the years after 1950, operative procedures were constantly studied and adapted to meet these changing conditions. As an essential concomitant of the slaughter policy the use of infected area restrictions which curtailed the movement of live poultry was extended. The Ministry also banned the movement of live poultry, including day-old chicks and hatching eggs, into Scotland and prohibited the movement of live poultry from any premises to which live poultry had been moved during the previous twenty-eight days. In 1954 a 'clean area' policy was introduced. That part of the country where the incidence of disease was negligible was declared a clean area and protected by prohibiting all movement into it of live poultry except day-old chicks and hatching eggs. The area included Wales, Cheshire, Derbyshire, Shropshire, Herefordshire, Warwickshire and Worcestershire. The success of the prohibition of movement into Scotland, where no outbreak had been recorded since 1951, was expected to be reproduced in Wales and those parts of England which had not shown that they were harbouring the disease, and it was hoped that eradication would follow vigorous action in the rest of the country.

The results were encouraging and at the end of 1954 the clean area was extended to include counties in the north and south-west of England. In June 1955 the distribution throughout the country of infected birds from a hatchery caused an abnormally high summer incidence. A further disappointment came in November when infection spread into the clean area in South Wales.

The developing poultry industry found the division of the country into clean and other areas an increasing handicap to expansion. The acute and sub-acute forms of the disease persisted in 1956 and it was not possible to extend the clean areas. As a result the policy was changed again. The standing arrangements restricting the movement of live poultry into the clean areas were abandoned except for the prohibition of movement of live poultry into Scotland. In their place the establishment of fowl pest infected areas was extended so that movement of birds was restricted within the areas and prohibited from them. It also became necessary to prohibit the holding of markets for store poultry in the months of October, November and December.

The quick elimination of any infection existing apart from the affected animal is a very necessary part of a policy which depends on slaughter of animals to check manufacture of viruses. The disinfection of infected premises was therefore subject to strict

supervision by the veterinary staff. Specific Orders which dealt with the disinfection of pens, crates and equipment after markets, and the cleansing and disinfection of slaughter premises, equipment and vehicles were made in 1952 and 1956.

A major epidemic which began in Lancashire in September 1955 was successfully brought to an end in May 1958 and was of considerable significance. It occurred in a very important egg-producing area where the poultry population is dense and intensive methods of husbandry are employed. To a large extent the industry is self-contained in Lancashire as there is considerable poultry breeding and other ancillary activity within the county. The control operation required an extended effort to ensure that owners reported suspicious symptoms promptly, and also full co-operation in the disease-control measures by the poultry industry in the county. The epidemic was finally brought to an end by early reporting and diagnosis, by progressively more realistic use of the power to destroy stock that might have been exposed to infection, and by improved methods of slaughter and disinfection. Another significant factor in the success that was achieved was the special arrangement made for re-stocking which was restricted in certain districts to day-old chicks. This procedure resulted in a sharp temporary fall in the density of susceptible poultry in particularly vulnerable districts. The achievement may also have been partly due to the absence of many large flocks of birds, particularly broiler chicken, reared by intensive methods.

Between 1951 and 1958 in only one year (1957) were there more than 1,000 outbreaks but compensation for birds that were slaughtered and for hatching eggs that were destroyed had been as high as £1,371,710 in 1956. However, the success in suppressing the epidemic in such an important poultry producing area renewed confidence and greatly influenced the steps taken in dealing with outbreaks in 1959. Unfortunately hopes were disappointed as outbreaks rose to 2,062 and compensation to £3,473,889. Trading movements and wind-borne infection from affected flocks of broiler chickens were the most important causes of spread.

The pattern was repeated in 1960 when outbreaks totalled 2,301 and compensation rose to £3,960,106 with a very high incidence of the disease in Norfolk and East and West Suffolk. The veterinary staff was extended to the limit in its efforts to combat the disease, veterinary officers and technical assistants continually being drafted to assist in the heavily infected counties, particularly in East Anglia.

As a result of the experience of 1959 and 1960, and the rising cost of compensation associated with the infection of large units, the Minister of Agriculture and the Secretary of State for Scotland appointed a departmental committee under the chairmanship of the economist Sir Arnold Plant in July 1960 'to review the policy and arrangements for dealing with fowl pest in Great Britain, and to advise whether any changes should be made in the light of the growth of the poultry industry, present scientific knowledge and technical and administrative experience gained in recent years in this and other countries'.

In the autumn of 1960 the Fowl Pest National Campaign Committee, composed of representatives of the NFU, various sections of the poultry industry and ancillary organisations, set up local county committees, and nationally and locally a widespread publicity campaign was undertaken, the object being to remind all poultry-keepers of their responsibilities for notification of disease and to give them guidance on methods of security against the introduction of infection to their flocks.

A marked reduction to 1,240 in the number of outbreaks occurred in 1961 and it was hoped that the effects of the slaughter policy, area and other controls, together with the efforts of the Campaign Committee, were beginning to show results. Nevertheless, despite fewer outbreaks, compensation reached £3,811,620, almost as much as in the previous year, mainly as a result of infection in turkey and other large flocks.

Contrary to previous experience the number of cases did not abate in Norfolk in the spring of 1962. Apart from a lull in February, disease ran at a high level throughout the summer and involved East Suffolk. Between April and October 1,062 cases were confirmed in these two counties. A series of outbreaks in the spring in Hampshire and Wiltshire accounted for 371 outbreaks and a further 80 cases occurred in Hampshire before the disease was finally eradicated. Some very large turkey-breeding flocks were involved. In late July disease appeared in Lancashire and, in spite of every effort to control the series by the slaughter of numerous adjoining flocks, disease continued to spread and 471 cases had been recorded by the end of the year. The involvement of large turkey flocks, large poultry breeding flocks and broiler units was mainly responsible for the towering compensation figure of £8,761,280 (3,384 outbreaks).

Meanwhile, the Plant Committee, which had taken evidence from a wide variety of opinion in this country and abroad and had visited Holland, the United States of America and Canada, had published its Report in March 1962 with two major recommendations: firstly, that an attempt be made to combine the continuance of slaughter to control the disease with the voluntary use of dead vaccine to limit the losses from it; and secondly, that the cost of compensating owners of slaughtered birds should be borne by the poultry industry by way of a levy imposed on day-old chicks.

The industry was invited to discuss these recommendations and it set up a consultative committee, representative of its various sectional interests, to negotiate on its behalf. The Consultative Committee concluded that if slaughter with full compensation at the expense of the industry were to continue then vaccine would not be used sufficiently widely to assist in the control of the disease: this assessment was accepted by the Ministry.

An announcement of changes in policy was made in July. The policy of slaughter with compensation would be abandoned on 31 March 1963 except for the peracute form of Newcastle disease, for fowl plague and for all types in Scotland; future control of the acute and mild forms of fowl pest in England and Wales would be based on the

voluntary use of approved dead vaccine, the cost of which would be subsidised for two years; the disease would remain notifiable, and control would be assisted whenever necessary by restrictions on movement of poultry.

Within a few days of the announcement of the change of policy one British manufacturer put on the market supplies of inactivated vaccine and between July and November 1962, when the distribution of subsidised vaccine began, issued some 11 million doses. In the meantime, machinery had been set up to arrange for the purchase of large quantities of vaccine, for its proper storage and for distribution from points established throughout England and Wales. Wide publicity was given to the new policy and explanatory leaflets and application forms for vaccine were distributed to all known poultry-keepers. Subsidised vaccine was first issued on 5 November in those parts of the country currently experiencing epidemics of fowl pest, and by the end of 1962 supplies of subsidised vaccine were freely available in all parts of England and Wales and 15 million doses had been issued.

The Plant Committee also recommended that importations of live poultry, day-old chicks and hatching eggs should now be permitted under quarantine conditions and subject to satisfactory veterinary certification from countries from which they had previously been refused. An amending Order was therefore made in 1963 and a number of importations of turkeys, ducks and domestic fowl, all as hatching eggs or day-old chicks, have since taken place from Europe, Canada and the United States of America with beneficial effects to the home industry.

The number of cases confirmed during the first year of the vaccination policy (2,736) compared favourably with those confirmed during the preceding year (3,337).

In an area where disease was prevalent and where vaccination was widely practised, control by vaccination gave better results than did the slaughter policy in previous years. Conversely, in an area where disease was prevalent but vaccination coverage was limited, control was less satisfactory and disease spread to counties traditionally free from disease.

The majority of breeding flocks were vaccinated, as were most broiler flocks, in spite of the difficulties of individual administration of vaccine. The owners of commercial egg-producing flocks were the most reluctant to adopt vaccination. In the first year 220 million doses of vaccine were sold. It had been made clear from the outset that adequate control could only be expected if some 80 per cent of the poultry population was vaccinated and a regular programme of vaccination maintained. Only in the Norfolk and Suffolk area was this level achieved and in fact this was followed by a lower seasonal incidence of disease in these counties in the spring of 1964 than for several years. In contrast, outbreaks had reached a high level in the winter in Lancashire where uptake of vaccine had been disappointing.

Multiplication of virus in infected vaccinated flocks was less than in comparable un-

vaccinated flocks and the number of secondary outbreaks resulting from infected vaccinated flocks was less than from flocks, similar in location and type, in the previous slaughter policy period. A careful survey showed that if voluntary vaccination, as practised, did not entirely prevent infection spreading within the flock, it certainly limited the severity of the disease and markedly lowered mortality.

The effects of vaccination became increasingly evident during the last six months of 1964. Outbreaks in England and Wales fell from 151 in May to 39 in August, the lowest total confirmed for any month since August 1960. The usual seasonal rise in the autumn occurred and, indeed, was only to be expected, but nevertheless the total of 51 outbreaks for September was the lowest for that month since 1955, and the totals for October, November and December (93, 85 and 126) were less than in any corresponding months since 1958.

Altogether there were only 447 outbreaks in England and Wales in the latter half of 1964, and the autumn/winter rise in incidence was markedly below that of earlier years. Except for 1958, when there were 444 outbreaks, there were fewer outbreaks in the last six months of 1964 than for any comparable period in the preceding ten years.

Although it is too soon to assess the ultimate effects of vaccination, at least the experience since the policy was adopted has proved encouraging.

DUCK VIRUS HEPATITIS

DUCK VIRUS HEPATITIS is a disease which appears principally in areas where the practice is to rear large numbers of ducklings continuously in duck-fattening plants. It was first recognised and reported in Long Island, USA, in 1949, and has since been diagnosed in Great Britain, Europe and South America.

It is a disease of young ducklings, characterised by sudden onset, brief illness, high mortality and rapid spread. Within a period of a few days mortality can be as high as 90 per cent in stock under three weeks old, after which age-resistance to infection increases rapidly. Affected ducklings fall on their sides, paddle their feet and draw their heads over their backs. The most characteristic post-mortem finding is a pale enlarged liver in which haemorrhages are conspicuous, although they may vary considerably in number and size.

The disease first appeared in Great Britain in the late summer of 1953 when an outbreak occurred in Norfolk. An eradication policy by stamping-out was considered but it soon became apparent that stamping-out was impracticable because the disease was more widespread than had at first been thought, and the prevention of the disease and the arrest of its distribution to other parts of the country became the accepted objectives. To achieve these, the Virus Hepatitis Order 1954 was made providing for the

detention and isolation of birds affected, or suspected of being affected, with duck virus hepatitis, and for the prohibition of the movement of poultry on to infected premises, and for cleansing and disinfection of these premises.

Experimental work at Weybridge led to the use of an attenuated strain of the virus as a vaccine. Large-scale field trials were carried out in Norfolk and two satisfactory methods of vaccination were developed. Ducklings are vaccinated by puncturing the foot-web with a suitably-mounted needle dipped in a suspension of the virus. A second method is the induction of a high antibody level in breeding stock by inoculation with relatively large doses of vaccine. The passive immunity transferred through the eggs is sufficient to protect the ducklings during the susceptible period. The trials were continued for several years, but since 1962 the vaccine has been produced commercially.

Very few outbreaks have been recorded outside the area occupied by the East Anglian duck-fattening industry in which the practice is to vaccinate the ducklings.

PSITTACOSIS OR ORNITHOSIS

PSITTACOSIS, a disease so named because it appeared to be associated with the keeping of birds of the parrot family, was first described as a clinical entity in man in 1879. The disease was sporadic in occurrence until 1929 when there was an unprecedented increase in the number of human cases in Europe and the Americas, all clearly linked with the importation of sick parrots. The mortality of sick birds in transit was high, they were distributed without quarantine to their prospective owners, and massive transfers of the infectious agent occurred, frequently with fatal results.

In 1930 the causal agent was shown to be a virus. Studies since then have shown the disease to occur in either overt or latent form in many species of birds other than the psittacine, for example, in pigeons, chickens, ducks and pheasants. The name *psittacosis* is usually reserved for the disease occurring in man and psittacine birds which include parrots, parrakeets, budgerigars, lovebirds, macaws and cockatoos; the name *ornithosis* has come to be applied to the disease occurring in non-psittacine birds. The virus itself belongs to the psittacosis-lymphogranuloma-venereum (PLV) group, and psittacosis-like viruses occur in mammalian as well as in avian species.

The Minister of Health introduced the Parrots (Prohibition of Importation) Regulations 1930 because of the disease hazard of imported parrots to man. However, it was later shown that the disease was apparently widespread in wild birds and, as man could be effectively treated with antibiotics, these regulations were revoked in 1952. Almost immediately, however, two outbreaks of ornithosis with heavy losses occurred in ducks in Surrey and Norfolk, and Orders were made by the Minister of Agriculture to

bring ornithosis within the scope of the Diseases of Animals Acts and to forbid, except in certain circumstances, further importations of parrots. This was done by the Psittacosis or Ornithosis Order of 1953 and the Parrots and Miscellaneous Birds (Prohibition of Importation) Order of the same year which were introduced primarily as measures for preservation of animal health, and which authorised control of ornithosis in affected domestic birds or flocks, as well as guarding against further introduction of disease from abroad.

The Orders enabled the Ministry to deal with these outbreaks of ornithosis on lines comparable to those used in handling outbreaks of fowl pest, that is, by slaughter with compensation paid for healthy birds, cleansing and disinfection of the premises and an interval before re-stocking. The prohibition of importation also prevented one method of introduction of fowl pest, since it had been discovered that a consignment of parrakeets from abroad, infected with that disease, had conveyed infection to domestic poultry with which they came in contact.

Importation of parrots by licence, under conditions which specified certain safeguards against the birds coming into contact with domestic poultry stock, was permitted for bona-fide pets, for breeding, for research purposes or for recognised zoos.

The widespread distribution of ornithosis virus would suggest that measures against introduction of the disease are likely to prove ineffective but, in practice, disease seldom seems to originate from wild birds, and the existing legislation provides an effective safeguard for domestic poultry and man against the most dangerous source of large quantities of virus, namely, imported cargoes of psittacine birds debilitated and weakened by the stresses of the journey.

GLANDERS OR FARCY

FOR many centuries before man harnessed steam the horse was of supreme importance and glanders was a most serious disease. It was insidious, chronic and fatal in horses and asses and occasionally in man himself. Nowadays it is no problem. It was eradicated from Great Britain in 1928 and persists in only a few countries of the world.

The disease was commonly encountered in two distinct forms. One, involving the respiratory system and the associated lymph nodes, came to be known as glanders. The other form was characterised by an ulcerative lymphangitis of the limbs and was known as farcy. Thus, both forms produced a syndrome of conspicuous lesions and other signs that facilitated accurate recording of the disease.

It follows that glanders is one of the few diseases that can be identified from descriptions in the ancient literature. Aristotle appears to have been the first to record it and Apsyrthus the first to mention its contagious nature. In the fifth century AD,

Vegetius used the terms *malleus humidus* and *malleus farcimosus* which probably referred to glanders and farcy respectively. He, too, recognised its contagious nature but went further than Apsyrtus in that he advised the isolation of suspected cases as well as the overtly diseased animals.

It was Fitzherbert, in his *Boke on Husbandry*, 1523, who first mentioned the disease in the English literature. His account of farcy was a particularly vivid one:

the Farcyon is but an yll soraunce, and maie well be cured in the begynnyng, and wyll appere in dyverse places of his bodye, and there will ryse pymples as much as halfe a walnut-shell, and they will follow a veyne, and wyll breake by it selfe; and as many horses as do playe with him that is sore, and gnape at the matter that runneth out of the sore, shall have the same soraunce within a moneth after: and therefore kepe the sycke from the whole. And if that soraunce be not cured betyme, he will dye of it.

Shakespeare also knew the disease as commonplace for he used it in a list of familiar equine disorders to convey the sense that it really was a very decrepit horse that took Petruchio to Padua to marry Kate:

... his horse hipped with an old mothy saddle, and stirrups of no kindred; besides possessed of the *gladders* and like to mose in the chine; troubled with the lampass, infected with the *fashions*, full of windgalls, sped with spavins, rayed with the yellows, past cure of the fives, stark spoiled with the staggers, begnawn with the bots, swayed in the back and shoulder shotten;

(*The Taming of the Shrew*, Act III, Scene 2)

Petruchio first tamed the Shrew in 1594. It was nearly two-hundred years later before the first conclusive step was taken towards a further understanding of glanders.

In the period 1790-92 Erik Viborg, a Dane, showed by experimental means that the discharge from a case of glanders could give rise to farcy when inoculated subcutaneously and that the farcy so produced might subsequently develop into glanders. He also showed that glanders material ceased to be infective when desiccated. Apart from the practical outcome, this work was significant in the fact that it represented a scientific, experimental approach to the problems of disease.

It was in this scientific vein and at about this time that proposals were made to raise the standard of veterinary medicine in Great Britain by promoting the study of animal diseases and instituting a formal training for practitioners. The scheme was successful and resulted in the founding of the London Veterinary College in 1791. St Bel was the first professor. His work was devoted entirely to horse diseases, of which glanders was becoming increasingly important because of the national demand for improved communications and services that could only be provided by horses. The disease became endemic in the town studs and its spread along the highways was facilitated by the postmasters and carriers who regularly worked glandered animals. St Bel's experiments investigated the transmissibility of the disease but his only publication on the subject was regrettably a posthumous one; he died of glanders in 1793.

St Bel's death now appears all the more tragic for he was succeeded by Edward Coleman, a surgeon, who reigned for the next forty-six years but did little to enhance the cause of scientific veterinary medicine. Neither did he publish anything useful on the glanders problem although there is evidence that he undertook experiments on it. He believed that the disease was an 'atmospheric impurity' caused by adverse environments such as poorly ventilated stables, and that not one horse in ten thousand caught glanders by contagion.

This was the popular view of the day. Despite the generations of evidence that emphasised the contagious nature of glanders it was widely argued that contagion was not the sole cause of the disease and that spontaneous generation was the usual origin. Only by a gradual process throughout the first half of the nineteenth century did the singular importance of contagion become appreciated and it was many more years before the concept of spontaneous generation was completely discounted.

Among those who held the contrary view, James White and Thomas Peall are particularly noteworthy. They were both Coleman's pupils but rejected his opinion on glanders. White qualified in 1797 and after five years' service in the Royal Dragoons published *A Compendium of the Veterinary Art* in which the chapter on glanders opened with the bold statement that it was a contagious disease although, on a later page, it was admitted that spontaneous generation was sometimes a possibility. White explained how to differentiate glanders from strangles and also gave detailed instructions for 'the most effectual mode of purifying stables in which Glandered Horses have been kept'. In subsequent editions he mentioned the fact that the French had enacted a law in 1784 to prohibit the keeping of glandered horses. Peall's views appeared in a book published in Cork in 1814. Possibly owing to the unusual imprint, his work was not widely appreciated but it clearly asserted that legislation was the only means of tackling glanders.

Thirty-nine years later, in 1853, the first legislation was introduced. It was simply an Act to prevent owners taking glandered horses to market or turning them out on the commons.

By 1869, with the memories of the rinderpest disaster still fresh, it was finally accepted that the diseases of animals warranted serious attention by Parliament. In that year the Contagious Diseases (Animals) Act was passed. Among its many sections it specified glanders as a contagious disease and provided for the compulsory burial of affected horses and the 'purification' of the sheds where they had been kept. Farcy was ignored in the Act but an Order in Council was made in 1873 to prevent the movement of horses with this form of the disease. By this Order farcy was declared a contagious disease under the Act of 1869 and it, too, became notifiable. It now seems incredible that glanders and farcy were still regarded as separate diseases for purposes of legislation but the reason lay in the belief that farcy was sometimes curable. It was not the last occasion for this futile distinction to be made.

The law was unimpressive but the technical advances of the period were startling. Pasteur's work was dispelling the myth of spontaneous generation and by 1876 it was generally regarded that glanders was due entirely to contagion. The proof came in 1882 when two Germans, Löffler and Schütz, isolated and described the causal bacillus and showed that they could reproduce the disease at will. There now remained only one more technical discovery that was necessary for its ultimate eradication.

The Contagious Diseases (Animals) Act of 1878, which replaced the former Act, required owners to slaughter cases of glanders and disinfect the premises, but animals with farcy could be isolated and treated. The stupidity of this was expressed by Hunting, the contemporary expert on the subject:

you cannot disinfect a living diseased horse, and it seems to me like swallowing a camel and straining at a gnat to compel the disinfection of stalls and sheds in which a glandered horse has stood, whilst permitting a horse with farcy to remain alive, during every minute of whose existence the specific poison of glanders is being actively developed and increased in his system.

Neither the Act nor the several Orders that followed it up to 1886 had any effect in diminishing the disease, and London remained the hotbed of glanders.

In 1892 there was a marked rise in the incidence of the disease. Three thousand horses were affected that year; 85 per cent of them were in London and another 10 per cent were in the neighbouring counties. The increase had coincided with an epidemic of influenza and Hunting suggested that this acute, febrile disease may have caused latent cases of glanders to develop into the overt form. The increase also coincided with the formation of the Public Control Department within the London County Council. This Department was to be responsible for enforcing the law relating to glanders and was undoubtedly perturbed at the prospect. Following representations to the Board of Agriculture, the Council was able to examine the draft of a new Order that was about to be made, the outstanding feature of which was *permissive* power for the local authority to adopt compulsory slaughter with compensation for all cases of glanders and farcy.

In the light of what happened subsequently, it should now be revealed that the London County Council agreed with the proposals for compensation in a letter to the Board dated 30 August 1892. The Order was sealed on 26 September but the London County Council then refused to assume the permissive slaughter powers that the Order offered. Among the reasons given was the heavy expenditure that the compensation would involve and the fact that the Order did not incorporate some of the recommendations that it had made to the Board, the chief of these being that private veterinary surgeons should be obliged to report all cases of the disease they encountered in practice. This was eventually met by a special Order in 1906, by which time the

objection of the profession was no longer valid as the Council was then employing a fulltime veterinary staff for its inspectorate.

The Council's action was clearly an embarrassment to the Board of Agriculture, the Chief Veterinary Officer noting in a memo that: 'the failure on the part of the London County Council to carry out the slaughter provisions of the Glanders and Farcy Order has led us into a difficulty from which it is very difficult to extricate ourselves.' The Council did apply some of the control measures but their posters made it abundantly clear that compensation was not forthcoming.

COUNTY OF LONDON.

CONTAGIOUS DISEASES (ANIMALS) ACTS.

GLANDERS OR FARCY ORDER, 1892

THE LONDON COUNTY COUNCIL HEREBY GIVES NOTICE that this order requires every person having, or having had, in his possession or under his charge any animal affected with Glanders or Farcy, to at once give notice thereof to the Police. Any such person failing to give notice is liable to a penalty of £20.

On the Police receiving notice, the animal affected will be examined by one of the Council's Veterinary Inspectors. Should it prove to be glandered, all necessary steps for its slaughter and for the removal and destruction of the carcase will, at the owner's request, be taken at the expense of the Council.

No compensation will be paid either in respect of animals or carcasses.

The symptoms of Glanders include:—

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Chronic cough. 2. Thin unthrifty appearance with rapid wasting. 3. Excessive staling. | <ol style="list-style-type: none"> 4. Enlargement of the gland (or "jug") under the jaw. 5. Slight sticky discharge from the nose. 6. An ulcerated patch on the membrane which divides the nostrils. |
|--|---|

The symptoms of Farcy include:—

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Thickened leg. 2. Corded veins. | <ol style="list-style-type: none"> 3. Small lumps (or "buds") on the hide, which afterwards burst and discharge sticky matter. |
|---|---|

CAUTION.—All who have anything to do with glandered or farcied animals should bear in mind the following facts:—

1. That disease can be communicated to man by discharge from the nostrils or other parts of a diseased animal or carcase.
2. That the disease in man is almost always fatal.
3. That it is specially dangerous for persons with scratches or sores on their hands or face to handle diseased horses or carcasses.
4. That by care and strict attention to cleanliness the danger of communication of the disease is avoidable.

BY ORDER,

COUNTY HALL, SPRING GARDENS,
January, 1893.

H. DE LA HOOKE,
CLERK OF THE COUNCIL.

The Board and Council came to terms two years later when the Glanders and Farcy Order of 1894 was made. This introduced what Hunting described as 'the novel and mischievous system' whereby local authorities had *permissive* power to slaughter diseased animals and pay compensation on different scales. One authority might choose to pay only carcase value whereas another might pay up to one-quarter the value of the animal before it became diseased. It also allowed the local authorities to slaughter cases of *suspected* disease provided that they had the permission of the owner.

The 1894 Order was not a success. The disease persisted and, apart from horses, continued to kill a few human beings. In 1899 it once again involved army horses after eight years of freedom following its eradication by George Fleming, Director of the Army Veterinary Department. That same year a Departmental Committee was set up to examine the position and advise on measures to improve it. The crucial flaw in the system was the failure to deal with animals incubating the disease. Horses with overt glanders or farcy could be slaughtered and their stalls disinfected, but once the carcasses were removed there was no further control over the premises. The veterinary inspectors were merely registrars of death who could not enforce restrictions on the in-contact animals that were developing the disease.

There was no longer an excuse for this deficiency. In 1890 the Russian veterinarian Kelning had followed the lines of Koch's tuberculin and produced from the glanders organism a substance called mallein. Further research with this by Professors Nocard and M'Fadyean had shown that it was a valuable diagnostic agent and from 1893 onwards it came into popular use by veterinary surgeons for indicating latent cases of disease.

The Board of Agriculture was slow to appreciate the immense value of mallein. The 1899 Departmental Committee examined no fewer than eleven witnesses on its utility and without exception they were adamant that it was an invaluable diagnostic tool but the Committee did not recommend its compulsory use. Instead the Board was recommended to 'conduct experiments with regard to the use and influence of mallein'. Another departmental committee was commissioned to undertake some experiments but its terms of reference bore no relation to the diagnostic potential of the agent. Any doubts on the test then gave way to fears concerning compensation. In 1903 Alexander Cope wrote in his Annual Report that: 'the crux of the whole question at the present time turns upon the amount of compensation which shall be given to owners for horses which are to all appearances healthy, but have reacted to the test, and who shall provide the necessary funds.'

The Treasury refused to assist with compensation because the Diseases of Animals Act of 1894 had stated that compensation for any disease other than rinderpest was to be a charge on the local rate.

It was inevitable that the compulsory use of mallein would be introduced and the

legislation to meet this took the form of the Glanders or Farcy Order of 1907. This was a realistic step to eradicate the disease rather than control it. The Mines Act of 1911 contributed by enforcing the mallein testing of pit ponies and an Order of 1920 altered the scale of compensation to allow for post-war inflation. The sole remaining loophole whereby diseased horses could be imported was stopped by a special Order in 1921.

From 1908 onwards the incidence of glanders steadily declined until 1928 when the last case was recorded. Eradication had succeeded but the triumph of the achievement is tinged with the irony that it coincided with the eclipse of the horse as an economic force.

EPIZOOTIC LYMPHANGITIS

THIS disease, which is a chronic eruptive infection of horses and other members of the Equidae, has not been seen in Great Britain since 1906. It is prevalent in the countries bordering on the Mediterranean, in some other parts of Africa and in several countries of Asia. Caused by a yeast-like organism *Histoplasma farciminosum* (*Cryptococcus farciminosus*) it is the only fungal disease which has been made notifiable by a Diseases of Animals Order.

After infection enters through a wound, healing occurs at the primary site before there is any evidence of the disease. Normally the first symptom is a small, hard, painless nodule on or near the original wound site, with swelling of the surrounding subcutaneous tissue. At the same time, or somewhat later, the local superficial lymphatic vessels enlarge and develop small swellings which later discharge pus and become chronic granulating ulcers. Any part of the body may be involved but lesions are most common on the shoulders, neck and legs, and occasionally occur on the mucous membranes of the mouth, nose and genitalia.

The disease is insidious and, once established, it is difficult to eradicate from large studs, as infection is spread not only by contact but by contaminated harness and saddlery and by flies. Treatment at first seems effective, but usually ulcers appear later on other sites of the body and euthanasia is generally advisable.

In 1902 some of the horses brought back to the British Isles following service in the South African War were infected with the disease and outbreaks were recognised at Army depots, mainly in Ireland, in 1902 and 1903. In November 1903 an outbreak was detected in a large stud in London. *The Times* in December 1903, referring to a meeting of the Royal Agricultural Society of England, reported that the Board of Agriculture was being requested to adopt immediate preventive measures against the disease, which should also be made notifiable to the local authorities. Early in 1904 the Board

circulated all local authorities, stressing the contagious nature of epizootic lymphangitis and the need for wide publicity so that an assessment could be made of its distribution.

A committee of veterinary experts was convened and in April all veterinary surgeons were advised of the character and dangers of this unwelcome importation. The lesions of the disease could easily be mistaken for those of farcy, the cutaneous form of glanders, which was then prevalent. The differential diagnosis lay in the microscopic identification of the fungus, and the negative response to the mallein test in those cases affected only by epizootic lymphangitis.

At the beginning of April an Order came into operation which made the disease notifiable to the local authority, to which it gave powers to prohibit movement of infected animals. The Order also made provisions for disposal of carcasses and disinfection. During 1904 there were 106 cases in military stables and 14 in other horses. The Army authorities took careful precautions to limit the spread of infection and by the end of the year the risk of widespread dissemination of the disease had been greatly reduced.

In addition to the difficulties associated with diagnosis there was the further complication that several months might elapse between infection and the appearance of diagnosable symptoms. The fungus could survive in imperfectly disinfected surroundings for a month or more. However, the disease was given considerable publicity, infected animals were slaughtered and, generally, the disinfection measures were rigorously enforced.

Following experience gained with the 1904 Order a new Order was made in 1905 which provided for the isolation of horses which had been in contact with infected animals. It was decided that no provision should be made in the main Order for slaughter and compensation but that these procedures would be dealt with by individual Orders for each case. Stewart Stockman, who was appointed Chief Veterinary Officer in 1905, expressed very grave doubts on the correctness of the diagnosis of at least ten of the fourteen cases of 1904 and he confirmed only two of the five cases which were recorded in 1905.

In 1906 there was an outbreak in London: infection was traced to another London stable where there had been two outbreaks in the previous year. The final outbreak of epizootic lymphangitis in Great Britain occurred in July of the same year in a stable of polo ponies in Barnsley, Yorkshire; the source of infection in this case remains a complete mystery.

Thus, epizootic lymphangitis had but a brief career in this country although, had it not been arrested, the spread of this disease could have had most damaging consequences on an economy whose agriculture and short-haulage transport were still entirely dependent on the horse.

PARASITIC MANGE OF HORSES, ASSES AND MULES

THIS contagious skin disease is of great antiquity. Writers in biblical times made references which have been considered to apply to it. However, the causal acari were not described or associated with the disease until as late as the nineteenth century and by this time it was one of the most serious scourges of military animals, notably during the Crimean, Franco-Prussian and South African wars. Before the turn of the century parasitic mange was of great concern in some parts of the United Kingdom and certain local authorities had made Orders to control it. The economic importance of the disease must be primarily assessed against a Victorian and Edwardian background when Great Britain was so dependent on horses and ponies. Not only were they important for town and country transport, including cabs and barges, and for agricultural work, but also in the mines. Mange continued as a cause of serious wastage during the First World War and for two decades thereafter, in spite of a good understanding of the necessary control measures.

The disease was accentuated by conditions of hardship, neglect, poor feeding and management, and it thrived in concentrations of horses. The incidence was therefore generally much higher in draught horses in and around large towns than it was among farm horses. It was rare in thoroughbreds and hunters which are subject to some degree of isolation and which get more individual attention. When draught horses on farms became affected there was often a history of the introduction of a 'cast-off' from a city stud or haulage firm.

There were three varieties of parasitic mange¹, sarcoptic, psoroptic and chorioptic or symbiotic, each caused by a distinctly different parasite specific for the horse tribe. The first two were also known as scab or itch, and colloquially in the London district and the Midlands as the 'Dukes' and the 'Fiddlers'. The chorioptic form was commonly referred to as leg mange. Although the different forms of this disease were present in the country at the same time, and individual animals could on occasion harbour more than one form of mite, literature indicates that there have been periods when one form predominated over the others. The sarcoptic form seems to have been the most common in the late nineteenth century and during the First World War, whilst the psoroptic variety was most prevalent in the first decade of the twentieth century and after 1918.

The sarcoptic variety is regarded as the most serious form of mange because the burrowing habits of the parasite make it the most difficult to cure. The mites bore through the epidermis, burrow beneath it and lay eggs in the galleries so formed. The initial

¹ Demodectic mange of the horse is ignored. It is of little significance and was never the subject of legislation.

sites affected are usually the shoulders, head and neck, but the disease can start at points of contact between the harness and skin. The irritation and inflammation result in loss of hair, formation of dry scales, crusts and open sores. In advanced cases the skin loses its elasticity and becomes dry and wrinkled, especially over the neck, shoulders and thighs. In under-nourished and debilitated animals neglect leads to emaciation and may even be fatal. Sarcoptic mange is communicable to man and references to its contraction by grooms and farriers are numerous.

Psoroptic mites live on the surface of the skin, biting into it for nourishment, and the inflammation and irritation set up results in loss of hair, sores caused by rubbing, and moist crust formation. Under these crusts the acari multiply. Long-haired parts on the neck, withers, rump and the base of the tail are favoured sites from which infestation spreads over the body. Thickening and corrugation of the skin are not so marked as in sarcoptic mange but itchiness is severe and affected animals have little rest. Here, too, neglect may lead to emaciation. Mange dressings are more effective against this surface-living mite than they are against the burrowing sarcopt.

Chorioptic (or symbiotic) mange, rarely encountered other than in heavy horses, is usually confined to the legs below the knee and hock. Scales and crusts with moist areas are produced, especially where they are hidden by long hair. At a later stage the skin becomes thickened into horizontal folds. Affected horses stamp their feet, rub their legs together and kick out as a result of the irritation and this often leads to leg injuries and may make the animal difficult to shoe. However, this form of mange rarely spreads to other parts of the body and is not so contagious as the other types, and animals under treatment can be kept at work. Consequently chorioptic mange was not of comparable importance and it was excluded from legislation in 1909.

There were several features common to the sarcoptic and psoroptic forms of the disease. The incidence was consistently much higher in the winter: there are several records of spontaneous, if temporary, recovery during the summer. Poor and under-nourished animals were more subject to attack. The signs of pleasure on grooming or scratching affected animals, such as leaning to the brush and lip response, were a feature of both forms. In fact they could not be distinguished with certainty on clinical examination, and diagnosis by demonstration of the burrowing sarcopt was not always easy even from deep skin scrapings, particularly if the suspect animal had been dressed prior to examination. Because, by 1911, magistrates were invariably demanding acari to be produced in court as evidence in prosecutions, this ability to demonstrate the parasite became of real practical importance.

Apart from interference with work, treatment of the disease was in itself a time-consuming and lengthy process to the extent that it was not economic in old or not too sound horses. These might have to be destroyed and at the stage when very few cases were being confirmed most affected horses were slaughtered.

The common routine of treatment was complete clipping, including the mane and often the tail; thorough washing to remove crusts and debris, followed by drying; application of dressings such as sulphur in an oil or fat base to the whole body, kneading the dressing over the body daily; and repeated applications of dressing to the affected areas once or twice a week. This was followed by a final washing to remove the dressing. The stall and head collar were disinfected at the same time. Lunging exercise and a good sweat were considered by many as important factors in the treatment.

Three such courses over a period of twenty-one days usually effected a cure but in advanced cases, particularly of sarcoptic mange, several months treatment, which involved repeated clipping, often proved necessary. Recrudescence was not uncommon because a few parasites could escape the treatment and could be transferred by grooming tools, harness and rugs. Thus, contact animals which were healthy had to be treated, and in the larger studs the stable routine was complicated by the need for strict discipline, the use of separate sets of grooming kit and the disinfection of the stalls and equipment. Another difficulty was that harness sores tended to occur in horses being worked while under treatment.

Although statistics since 1912 show that an average of less than two animals were affected per outbreak, spread in a stud was often rapid, especially if stable management was slack; for example, in the 1920's in one town stable of 120 horses approximately 100 became affected over a period of about six months, despite treatment.

The official history of the disease in civil animals begins in Great Britain with the Annual Report of the Agricultural Department of the Privy Council for 1886. It referred to severe skin disease among ponies on the Isle of Fetlar in Shetland due to the importation from the county town of Lerwick of a horse suffering from sarcoptic mange. Over 500 ponies were affected at one time and 70 died. As a result of this outbreak the first control Order was made; the Shetland (Sarcoptic Mange) Order 1886. This empowered the local authority to make the disease notifiable in horses, asses and mules, to prohibit and regulate movement, to require treatment and to permit the display of warning notices. The disease was successfully eradicated from Shetland and the provisions of this Order were the basis of succeeding legislation.

From then onwards other local Orders were authorised by the Privy Council and later by the Board of Agriculture so that, by 1911, twenty-seven counties, ranging from Cornwall to Aberdeen, were covered by Orders. However, it was well known that disease existed in areas without legislation, and there was some difficulty when affected animals from these districts were moved temporarily to areas which did have statutory provision against the disease. Further action was obviously needed. It was appreciated that this was a disease which could be readily recognised and reported by owners and which veterinary surgeons could treat successfully if they had the necessary authority.

It was therefore decided to introduce legislation to cover the whole country. This was brought into effect on 1 January 1912 by the Parasitic Mange Order of 1911 and it resulted in an immediate reduction in the number of outbreaks.

Unfortunately the First World War made it necessary to revoke certain regulations including the Parasitic Mange Order which was suspended from 6 August 1914 to 27 March 1915. This, and the difficulties of the period for owners and local authority officers alike, resulted in a marked increase in mange to a peak figure of 5,003 outbreaks in 1919.

The Annual Report for 1917 referred to the continued unsatisfactory position in horses owned by civilians.

The number of animals stated to have been attacked by the disease is 4,873. Horse-owners are, at the present time, faced with exceptional difficulties and the duties falling on Officers of Local Authorities are specially onerous, nevertheless it is important in the National interests that this disease should be kept in check since its existence causes loss of horse power at a time when the work of every available animal is needed. It is hoped that some further measures may be devised to curtail the spread of the disease, the prevalence of which has a direct effect upon the National food supply, in view of the fact that a number of outbreaks have occurred among farm horses, including those bought by the Board's Food Production Department and hired out to farmers in connection with their ploughing schemes. As a result of this disease the number of horses available for agriculture at a critical period of the year has in certain districts been reduced.

The rigours of the time plainly had a bearing on the making of the Parasitic Mange (Amendment) Order 1918 which modified the movement restrictions on animals affected with psoroptic mange so that they could be licensed off infected premises for work.

In 1919 the disease existed in all counties of England, the highest incidence being in the large towns. Of the 4,438 outbreaks, 1,230 were in London, Middlesex and the Metropolitan Police Divisions of the four adjoining counties, and more than half the outbreaks in Scotland were in Glasgow.

By 1938, when the current Parasitic Mange Order was introduced, satisfactory progress in eradication had been made. The annual total of outbreaks subsided year by year from 3,551 in 1920 to 46 in 1938, and no cases of either sarcoptic or psoroptic mange have been confirmed in this country since 1948.

The increasing replacement of horse transport by motor vehicles in the late 1920's had an effect, but the control measures had proved themselves by that time and the total eradication of this disease from Great Britain may justifiably be regarded as a very considerable achievement, particularly since it was effected before advantage could be taken of the more up-to-date forms of acaricides.

RABIES

NO DISEASE is more dreaded than that known in animals as rabies and in man as hydrophobia. Indeed, in man, the terrifying course of the disease with its inexorable progress following the onset of symptoms to madness and death led, not infrequently in the days of our forebears, to the practice of euthanasia by suffocation. Such was the measure of the horror it inspired. Its character has not altered.

It might be thought that with a disease of such an appalling nature measures for its control and eradication in animals, and therefore in man, would be welcomed and even demanded by the populace. This is far from the case: it is a paradox of our national character, through the traditional British love of animals, particularly of domestic pets, that no animal disease control measures have aroused so many passions, so much antagonism or such fierce resentment as those designed to keep this scourge for ever from Great Britain. Rational thought tends to be thrust aside and the public weal ignored in the anxiety to avoid quarantine of a much-loved pet. This attitude of mind is not peculiar to Britain: it is a fact that rabies control measures, wherever they are adopted, are nearly always opposed or at the very least resented by many of the potential victims of hydrophobia.

It is against this somewhat hostile background that the story of rabies control in this country, as in others, must be set; and it must be said that the State Veterinary Service has never flinched from its concept of duty on how the disease should be controlled despite, from time to time, the pressure of ill-informed criticism. So seriously was this disease regarded by the Veterinary Department of the Board of Agriculture that when, in 1889, local authorities were lax in enforcing their permissive powers of control, with a consequent increase in the number of cases, it did not hesitate to override them by introducing the Rabies (Muzzling of Dogs) Order of that year; thus bringing that aspect of disease control under central authority. When a not dissimilar situation arose in 1892 in respect of glanders, A. C. Cope, soon to be CVO, referred regretfully to this in a minute in which he wrote: 'it is obvious that we cannot supersede the LA as we did when they failed to carry out the Rabies Order because we are without staff or funds'.

It should be emphasised that the rabies control measures in Great Britain were designed and introduced to protect the animal population, but obviously they had a direct effect on the disease in man although this is, of course, a public health responsibility.

Rabies in animals in this country is of unknown antiquity but, as there is no record or evidence of a wild-life reservoir, it may be questioned whether it was ever truly endemic or whether it was periodically introduced by importation and spread within

the country through contact with animals which became rabid. It was certainly sufficiently established to be the subject of tentative legislation in 1831 in a 'Bill to Prevent the Spreading of Canine Madness' and it is known to have been a serious problem at that time in heavily populated urban areas in the Midlands.

The legislative history of rabies in Great Britain follows the common pattern of early legislation of animal diseases in being initially a local, permissive, responsibility and later, following committee recommendations, being brought under efficient central control leading eventually to eradication. Rabies is unique, however, in that following sixteen years of freedom it was subsequently re-introduced by the illegal importation of a dog only to be eradicated again four years later. In its continued absence, pressure is brought to bear from time to time and from varied sources to ease or remove essential safety precautions; so far without success.

Pasteur's work on rabies vaccination, allied to an increasing concern for public health problems, led to legislative control when, in 1886, rabies was made notifiable under the Contagious Diseases (Animals) Act of that year. The Rabies Order of 1887 gave local authorities permissive powers to muzzle and control dogs, to seize, detain and dispose of stray dogs, and to regulate or prohibit the holding of dog shows. As so often happened with local Orders, their interpretation and application varied considerably and the incidence of disease rose dramatically in 1889 to reach a total of 340 cases, 312 of them in dogs.

The weight of infection was particularly heavy in the London area early in the year and it was decided to bring the disease under a degree of central control by the introduction of the Rabies (City and Metropolitan Police Districts) Order on 1 August 1889. This was followed in December of that year by the Rabies (Muzzling of Dogs) Order which came into effect on 1 January 1890 and which extended the area of restriction around London and included other continuing foci of infection, chiefly in the Midlands and Home Counties. The Orders suspended the permissive regulations and required the local authorities of the specified areas to enforce their terms which, basically, were that all dogs were to be efficiently muzzled in public, that all strays and dogs found unmuzzled were to be seized and appropriately dealt with, and that any animal found suspected of having rabies was to be forthwith slaughtered.

The first effect of the Orders was to clear city streets of a considerable number of stray and ownerless dogs and, indeed, muzzling is accepted as a most essential preliminary step in the suppression of rabies in a district. It is significant that in 1889, no fewer than 121 of the 312 dogs recorded as rabid were strays or 'if not actually ownerless were, when found diseased, so far from their owners' premises that the ownership could not be traced by the police'. It is, of course, the irresistible wanderlust of the rabid dog, with its tendency to bite or snap at anything which comes in its path, that makes this animal the principal factor in the spread of disease. In the absence of a wild-

10 February 1831.



A

B I L L

To prevent the spreading of Canine Madness.

Note.—The Words printed in *Italics* are proposed to be inserted in the Committee.

WHEREAS many of His Majesty's Subjects have suffered from the disease occasioned by the bite of Dogs in a rabid state, and in such cases death hath ensued: And whereas in cases where parties suffer from the bite of Dogs no summary compensation can be had by them for the same, and it is expedient to provide such summary compensation: And whereas mischief to other Animals in which His Majesty's subjects have a property, hath also often ensued from the bite of Dogs: And whereas no summary compensation for such mischief can be had by the owners of such Animals; and it is therefore
 10 expedient at all times, when Canine Madness is known to be prevalent, to prevent Dogs from going at large, and to empower Justices of the Peace and others to fine the owners, and if necessary, to cause any Dogs to be destroyed, and also and at all times to make summary compensation to the parties injured by the bite of Dogs, or to the owners
 15 of Animals so injured; *BE it therefore Enacted*, by The KING's most Excellent MAJESTY, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the Authority of the same, THAT from and after the passing of this Act, it shall be lawful for any Justice of the Peace,
 20 or Chief Magistrate, on information or suspicion of the existence of Canine Madness, to issue a public Notice, requiring all Dogs within any parish, wapentake, division, city, borough, liberty, township, market town, franchise, hamlet, tithing, precinct and chapelry, mentioned in such notice, to be kept confined during the time therein stated;

Preamble.

Magistrates,
 upon information of
 Canine Madness, empowered to
 issue Notices, ordering all
 Dogs to be confined.

life reservoir in Great Britain the disease, being virtually confined to dogs, has never been a problem in rural areas where such animals are habitually under control. The only farm animals prone to be infected are those bitten by rabid dogs 'on the run', sheep being the most likely victims. When other animals are involved, spread is not likely to occur. A classic instance of this was the remarkable outbreak in 1886 amongst fallow deer in Richmond Park originating, it is presumed, from the attacks of a stray, rabid dog. The disease resulted in the deaths of 257 deer. Many of these cases were due to attacks by rabid deer although the absence of upper incisor teeth probably prevented more animals from being infected and also accounted for the slow progress of the disease throughout the herd, which was affected for rather more than a year. Even with such numbers involved there was no evidence of spread from this outbreak which serves to re-emphasise the important difference between the wandering carnivore as a carrier of infection and the animal under confinement in one form or another. The park deer, of course, must be considered domestic rather than wild animals and such is their disinclination to stray from their normal pastures that the disease did not even spread to the herd of red deer which also inhabit part of Richmond Park.

An essential factor, then, in eradication was, and is, elimination of the uncontrolled dog in urban communities. A muzzling Order served not only as an indication to authorities of stray or ownerless dogs but as a warning to dog owners. The knowledge that unidentified dogs might be slaughtered was sufficient to ensure that most owners kept careful control over their pets.

Thus, within twelve months of operation, the muzzling Orders more than halved the rabies incidence, to a total in 1890 of 129 cases in dogs, of which 67 were strays. This decline continued to 79 in 1891, and only 38 in 1892.

The muzzling Orders, successful though they proved, were far from popular, many local authorities joining with dog-owners in loud protest against them whilst the general public seemed altogether indifferent. As the incidence decreased, the volume of complaint and criticism rose until in 1892 the Orders were revoked in deference to the general wish. Control was returned to the local authorities with, however, the important proviso that they were specifically obliged to seize and dispose of all stray dogs in their districts. The report of the chief travelling inspector for that year warned that 'probably the complete eradication of the disease in this country cannot be anticipated so long as the free importation of dogs from foreign countries and Ireland is continued'. He went on to say, somewhat optimistically, 'the powers possessed by Local Authorities if properly and promptly exercised should render it impossible for the disease ever again to exist to the same formidable extent as in the past'.

Three years later, in 1895, the incidence of rabies was at its highest with 727 recorded cases, of which 672 were in dogs.

As the incidence increased in animals so it did in man. Clearly this trend could not be

allowed to continue. A departmental committee, that traditional precursor to government action, was appointed in 1896 with C. A. Whitmore, MP, as chairman. It was given a very wide latitude 'to inquire into and report upon the working of the laws as relating to dogs'. It concluded that the eradication of rabies was both feasible and opportune and that to do this it would be essential to impose central control, to enforce muzzling orders strictly when their use seemed necessary, to trace the source and movements of all rabid dogs and, equally, to trace and isolate or slaughter their contacts and, perhaps most important of all, to prevent fresh introduction of disease from abroad by strict regulation and control of importation of dogs.

Here at last were the foundations for successful eradication. The recommendations of the Committee were given effect by the Rabies Order and the Importation of Dogs Order, both coming into operation in 1897, and by the Dogs Registration Act 1898. By concerted efforts on the part of the veterinary staff and the now alarmed local authorities, and with the general co-operation of the public, the disease was tackled on a national scale and, after some tribulation over the Importation Order, which was at first largely evaded and which had to be replaced in 1901 by an Order at once more simple and more severe,¹ the disease was completely eradicated in 1902.

Summarising the campaign in his Report for 1903 the Assistant Secretary of the Animals Division, A. M. Anstruther, wrote:

The policy was the subject of a storm of hostile criticism, and the critics proved to their own satisfaction that for various reasons it could never prove successful. The Department was assailed on the one hand by persons who held that cruelty was caused by the use of the muzzle, and on the other hand, by persons who thought that any restriction on the importation of their pets was a piece of 'un-English' tyranny. For a time it required all the fortitude of those responsible for this policy, to withstand these attacks. . . . Events have amply justified the action taken . . . the disease has now been eradicated. It must not be forgotten that with the disappearance of Rabies the danger of contracting Hydrophobia, the allied disease in man, in this country has also ceased to exist.

Rabies was prevented from being re-established by the integrity of the customs officers and by the efficiency with which the importation and quarantine regulations were carried out. This aspect of disease control is told elsewhere in this book and it is enough here to stress the utter dependence placed upon the vigilance of customs officials as the first line of defence. For the next sixteen years Great Britain enjoyed complete freedom from this horrible disease.

Attempts are made, however, to smuggle animals into the country and circumstances may arise which, innocently or not, encourage the avoidance of quarantine. Thus it was that towards the end of the First World War, probably in May 1918, rabies was

¹ See page 272.

re-introduced to Great Britain by a dog from abroad which had eluded the authorities at Plymouth where, as elsewhere, the regulations had been made 'difficult to carry out owing to the vastly increased traffic, the inevitable congestion at the ports, and to the diminution of the staffs both of the Customs and of the Police'.

Circumstances conspired against eradication. Freedom for so long a period from the disease had made veterinary surgeons and public alike unfamiliar with its symptoms and this must inevitably have led to delay or error in diagnosis. It was in fact not until the end of August, at least three months later, that the first definite intimation of suspected rabies was received by the Department and not until 7 September that its presence was confirmed. By now disease had spread so that tracing had been made complex; nor was it possible to get any precise information about the original illegal importation. Further, the stock of dog muzzles available was deficient and war conditions were obstacles to their manufacture due both to shortage of labour and suitable wire. It was not therefore possible at once to enforce muzzling Orders over any wide area, and it is scarcely surprising that before the outbreak had been brought to a halt 129 cases of rabies had been confirmed in Devon and Dorset, all attributed to the original illegal importation. Nor was this all, for another series of outbreaks occurred in Kent, Essex, South Wales, London and Wiltshire. No definite origin was established for these cases and it is possible that further illegal importations by returning troops may have resulted in fresh introductions of disease. On the other hand, movement of animals may have disseminated infection from the original focus in the West Country.

Altogether 319 cases were confirmed before the disease was again eradicated and it was four years before this was at last accomplished in 1922: a heavy price to pay for carelessness or selfish inconsideration.

Other than in approved quarantine kennels rabies has not since reappeared in Great Britain.

As time passes, the ravages of this disease are forgotten; this amnesia, added to the sentiment felt for pet animals, and allied to the development of vaccines of reputable efficiency, has led to renewed demands for mitigation or even total removal of the import and quarantine regulations. The Animal Health Division is well aware of this feeling and it has recently fully explored the possibility of amending the conditions of entry of dogs and cats from rabies-free countries so that they would be kept in quarantine only for a short period of about ten days while formalities were completed. There are, alas, serious difficulties. A country may only be accepted as rabies-free if there has been no case in domestic dogs or cats for at least a year, if there is no involvement of wild life in the country itself or in a neighbouring country across a land frontier, and if there are adequate safeguards in force to prevent the introduction of disease with imported animals. Very few countries qualify. There is also the problem of protecting animals from contracting infection *en route*. This can only be done with confidence by keeping the

dog or cat in a secure nose-proof and paw-proof crate during the whole period of transit. This being so, animals from nearby countries could readily be accepted, but none is rabies-free as defined other than the Channel Islands, Northern Ireland, the Irish Republic and the Isle of Man, from which dogs and cats are already accepted without quarantine. From distant countries, obviously, there are almost insuperable difficulties of transport.

Twenty-three cases of rabies have been confirmed in imported animals since 1922; one dog was dead on arrival and twenty-two developed the disease in quarantine. No cases have occurred since 1949. The strict requirements and the expense of quarantine undoubtedly limit the numbers of dogs and cats which annually pass through quarantine stations in this country. Present importations are nearly all highly-prized animals reared and kept under close control, but any relaxation of the quarantine requirements might result in substantial importation of casual pets and adopted strays of doubtful background and therefore with an unknown but certainly much greater chance of exposure to infection. The risk of introducing disease would thus be vastly enhanced.

Nor can the human aspect be ignored. The public knows that in Great Britain dog bites do not provoke a sinister anxiety about rabies; nor is that malady a complicating factor in the diagnosis of canine ailments. If, however, rabies existed in this country, then every dog showing nervous aggression or hyper-excitement would have to be regarded as a potential case, and diagnosis of small animal disease would be a protracted and hazardous business.

In this context may be quoted the words of a leading American veterinary public health authority, J. M. Steele, writing in August 1964 in the *Journal of the American Veterinary Medical Association*:

... so long as rabies continues to occur in animals, even at a low level, *every animal-bite case must be viewed as a possible exposure to this disease.*¹

Much has been written about the efficiency of the Flury vaccine and it has been suggested that vaccination should, under certain conditions, replace the quarantine period. There is no doubt whatever that vaccination can play an important rôle in the control of rabies in areas where it is endemic. The Malayan campaign of 1952-54 demonstrated that when a wild-life reservoir is absent and the virus is thereby confined to manageable animals it is possible with adequate movement control, muzzling orders, the ruthless destruction of stray dogs and the intelligent use of vaccine to eradicate the disease from such an area. Where wild life is involved vaccination of dogs is, indeed, the essential feature in the protection of man. However, it must be emphasised that no vaccine so

¹ Author's italics.

far produced is completely successful, the hazard of incomplete protection still remains and deaths both in man and animal have occurred in spite of vaccination.

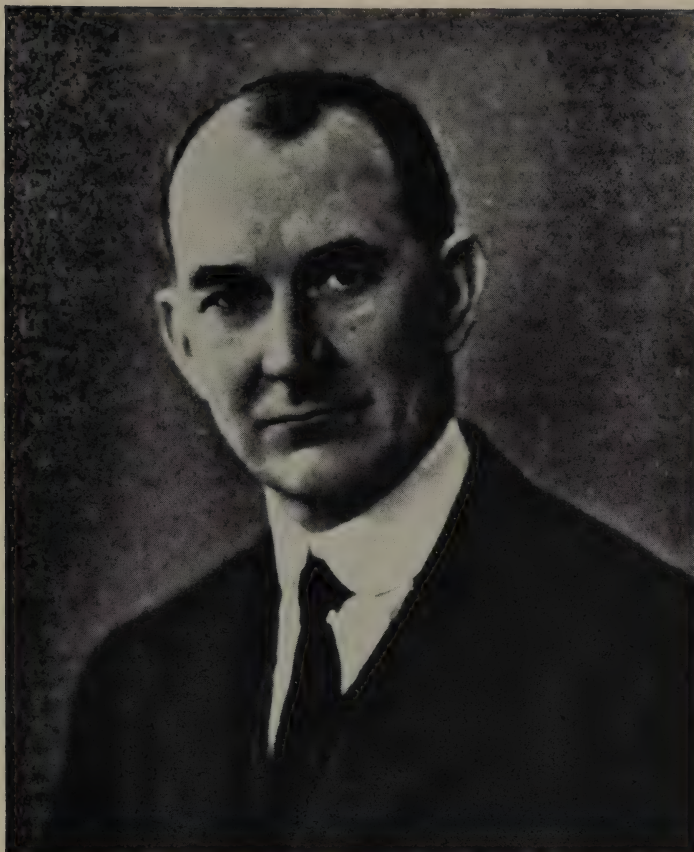
In an island country free of rabies, with no wild-life reservoir, and which can be comparatively easily protected against the introduction of disease by controlling importations, there can be no place whatever for vaccination.

BOVINE TUBERCULOSIS

THERE is reason to believe that tuberculosis was a feature of the life of ancient urban civilisations but not of primitive societies. Although the existence of harmful micro-organisms was unknown until comparatively recent times there seems to have been, even in the pre-Christian era, those who believed that diseases such as tuberculosis did not arise spontaneously and that some 'contagion' spread from one subject to another. Under natural conditions animals usually come to terms with parasites in their environment but with domestication, which inevitably followed the evolution of human societies into larger and larger groups, the natural balances became lost. This was particularly so in Europe as a result of the Industrial Revolution when, to meet the needs of an ever-expanding urban population, cattle were maintained in crowded, unhygienic conditions ideal for spreading disease. As these conditions applied to man as well as to animals it is not surprising that during the nineteenth century tuberculosis attracted increasing attention among physicians and veterinarians. It was referred to by a variety of names, the commonest being consumption, pining, grape disease and pearl disease and it seems to have been about 1840 that the name tuberculosis came into general use.

Although there were undoubtedly earlier experimenters in the field, Villemin (1865) in France is generally credited with being the first to show experimentally that the disease was transmissible from one subject to another. His work was confirmed by Chauveau, also in France, and by Cohnheim in Germany in 1869. It was not, however, until March 1882 that Koch was able to announce at the Physiological Society in Berlin that he had isolated the causal organism. Koch at first believed that there was only one type of the organism but in 1889 Rivolta showed that the disease in chickens differed from that in cattle and in 1890 it was established that there was a distinct type of the organism responsible for the disease in fowls. Work by Theobald Smith between 1896 and 1898 showed that there were differences between the types of organisms usually found in man and cattle. Koch accepted Smith's findings and seems to have assumed, from the discovery that the human type of the organism had a low pathogenicity for cattle, that the converse was also the case. At any rate it seems most surprising that Koch, familiar as he was with the disease in man and cattle, and whose

PLATE IX



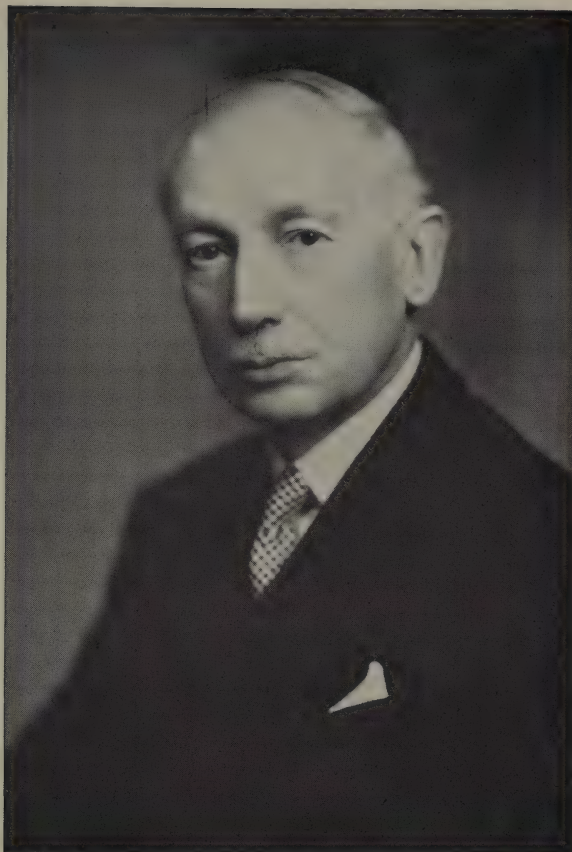
Sir James Joseph Ralph Jackson, MRCVS
Chief Veterinary Officer: appointed 7 June 1926
Knighted 1929
Retired 16 August 1932
Died 2 August 1943

PLATE X



Sir Percy John Luxton Kelland, MRCVS
Chief Veterinary Officer: appointed 17 August 1932
Knighted 1937
Retired 1 June 1938
Died 24 August 1958

PLATE XI



Sir Daniel Alfred Edmond Cabot, MRCVS
Chief Veterinary Officer: appointed 2 June 1938
Knighted 1943
Retired 21 August 1948

PLATE XII



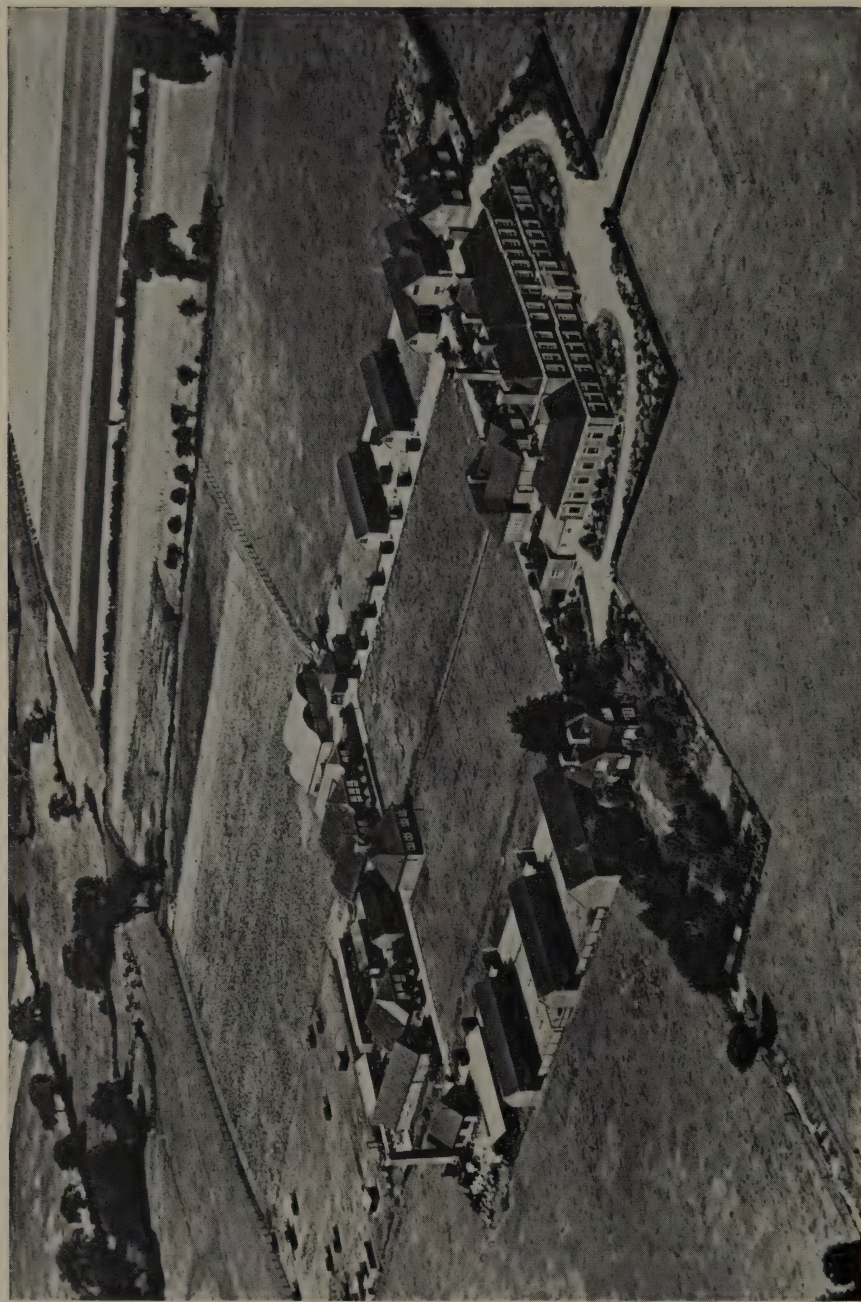
Sir Thomas Dalling, MA (Cantab.), LL.D(hc), DSc(hc),
DVM(hc), FRCVS, FRSM, FRSE
Director of the Veterinary Laboratory 1942-50
Chief Veterinary Officer: appointed 21 August 1948
Knighted 1951
Resigned 31 March 1952
Past President of the Royal College of Veterinary Surgeons

PLATE XIII



Sir John Neish Ritchie, CB, DVSc(hc), LL.D(hc), BSc,
FRCVS, DVSM, FRSE
Chief Veterinary Officer: appointed 31 March 1952
Knighted 1961
Past President of the Royal College of Veterinary Surgeons

PLATE XIV



The Ministry's veterinary laboratories at Weybridge, 1932

PLATE XV



The Ministry's veterinary laboratories at Weybridge, 1964

PLATE XVI



A group photograph taken at Weybridge on the occasion of the first meeting of senior officers of the Animal Health Division in 1938

From left to right, standing:

N. H. Hole, RO, J. Fox, MC, SI, H. L. Torrance, SI, G. Atkinson, SI, J. N. Ritchie, SI, N. Dobson, SRO, V. Boyle, SI, A. B. Kerr, SI, A. D. J. Brennan, SI, S. B. Vine, SI, J. M. L. Penhale, SRO, H. B. Allan, SI, W. L. Sheffield, SI, H. T. Matthews, SI, H. H. Green, SRO, G. Durrant, SI, C. Macpherson, SI, E. L. Taylor, SRO, L. Hughes, SI, J. G. MacGregor, SI.

From left to right seated:

A. Douglas, SI, W. J. Young, SI, G. V. Slinn, SI, J. O. Powley, SI, W. G. Wragg, CSI, E. C. Lloyd, DCVO, D. A. E. Cabot, DCVO, D. Vandepeer, Assistant Secretary, Sir John Kelland, Chief Veterinary Officer, W. H. Andrews, Director of the Veterinary Laboratory, T. M. Doyle, Deputy Director, G. T. Matthews, SI, A. B. Fewings, SI, E. Brown, SI, H. Gooch, SI, T. G. Millington, SI, R. Simpson, SI, D. S. Rabagliati, SI.

Absent: J. D. Broome, SI

DCVO: Deputy Chief Veterinary Officer; CSI: Chief Superintending Inspector; SI: Superintending Inspector; SRO: Senior Research Officer and RO: Research Officer.

views were invariably based on so much meticulous and repeated experiment, should have committed himself to the view which he expressed at the International Tuberculosis Conference in London in 1901.

Though the important question whether man is susceptible to bovine tuberculosis at all is not yet absolutely decided, and will not admit of absolute decision today or tomorrow, one is nevertheless already at liberty to say that, if such a susceptibility really exists, the infection of human beings is but a very rare occurrence. I should estimate the extent of infection by the milk and flesh of tuberculous cattle and the butter made of their milk as hardly greater than that of hereditary transmission, and I therefore do not deem it advisable to take any measures against it.

This view was contested particularly by M'Fadyean and by Ravenel of the U.S.A. The former said:

It cannot be admitted that the low virulence of human bacilli for cattle proves, or even makes it probable that bovine bacilli have only a feeble pathogenic power for man. The ideal method of counteracting this source of human disease would be to stamp out bovine tuberculosis, or to prevent the sale of milk from every cow that is tuberculous. Unfortunately it must be admitted that at present that is unattainable.

ROYAL COMMISSION ON TUBERCULOSIS

So great was Koch's prestige that the inevitable controversy which ensued had to be settled and in August 1901 a Royal Commission with firstly Sir Michael Foster as chairman, succeeded on his death by Sir W. H. Power, and including as a member John M'Fadyean, was appointed to enquire and report with respect to tuberculosis:

1. whether the disease in animals and man is one and the same;
2. whether animals and man can be reciprocally infected with it;
3. under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission.

This Royal Commission was unusual, if not unique, in that instead of taking evidence from witnesses and interested bodies it decided to carry out the necessary work itself. Lord Blyth made available two small farms near the village of Stanstead in Essex, as well as a house in the village itself. On these premises two entirely independent sets of experiments were set up with elaborate precautions to see that they remained absolutely separate. Three interim reports were produced in 1904, 1907 and 1909, and a final one in 1911. The most important of the interim reports, the second in 1907, gave an account of the human and bovine types of the organism and concluded that a very considerable amount of disease and loss of life, especially among infants and children, must be attributed to the consumption of cows' milk containing tubercle bacilli. In the final report an account was given of the three types of organism as well as the disease in various animal species. It was also stated that man must be added to the list

of animals notably susceptible to the bovine tubercle bacillus. This was a complete refutation of the views of Koch. Settlement of the controversy, however, seems to have been of more importance than the significance of the findings since although an Order giving local authorities power to deal with clinically affected tuberculous cattle was made in 1909 it never came into operation. It was not until May 1913 that such an Order did come into effect, but the 1913 Order was replaced by another in June 1914. This latter Order was, however, revoked in August on the outbreak of war.

MYCOBACTERIUM TUBERCULOSIS

The causal organism, which was long known as bacillus tuberculosis, or the tubercle bacillus, is an acid-fast organism now classified in the genus *Mycobacterium*. The genus contains such well-known pathogens as the organism causing leprosy in man, and John's disease (paratuberculosis) in cattle, as well as others causing rat leprosy and skin conditions in man (*M. ulcerans* and *M. balnei*). There are also many other mycobacteria common in nature which are not ordinarily pathogenic, although one of them, *M. smegmatis* (*lacticola*), has been found on several occasions associated with a mastitis similar to tuberculous mastitis. In these cases the mastitis (tuberculoid) occurred in a quarter which had previously been treated with an oily-based antibiotic. Cases have occurred in which *M. tuberculosis* was introduced into the udder during treatment of mastitis by infusion. Following this experience the use of individual collapsible tubes containing the requisite treatment for an affected quarter became general.

Three types or strains (bovine, human and avian) of the organism are recognised, but the disease process produced by all three is essentially the same. Although each strain has certain morphological characters of its own the essential differences lie in their cultural characters and pathogenicity for animals. Differentiation of mammalian and avian types is relatively easy on cultural characters and effects on the guinea-pig which has high susceptibility to both mammalian strains. The avian strain produces only a local lesion in the guinea-pig unless very large doses are used. Rabbits die as a rule of acute general tuberculosis within five weeks following inoculation with the bovine strain, but the same dose of the human strain does not normally cause death. The avian strain usually causes death of the rabbit within ten weeks, and the type of disease produced is commonly of the septicaemic (Yersin) type. Chickens usually die within ten weeks of inoculation with the avian type but are not affected by the bovine or human types.

In culture, growth of the human strain is greater and more profuse (eugonic) than the bovine strain (dysgonic) and glycerol favours its growth. As a rule avian strains grow more readily and profusely than human strains. Of the three strains, because of its great invasiveness, the bovine strain is probably the most virulent. It is the usual

cause of mammalian tuberculosis in animals (with the exception of the dog) and is also very pathogenic for man. The human strain, on the other hand, seems to have adapted itself essentially as a human parasite and has little pathogenicity for other animals, except other primates and the dog. The avian strain, being adapted to a body temperature considerably higher than that of mammals, does not as a rule produce progressive tuberculosis in animals or man. Occasionally it causes generalised disease in cattle and pigs but when it does in man it is usually in the presence of some other pathological process.

There is also a murine type of organism which sometimes causes epidemics of a tuberculosis-like disease in wild voles, and strains causing a similar disease in cold-blooded animals have also been described. The latter strains are not pathogenic for mammals.

An acid-fast organism of degenerate appearance has been found associated with the condition known as skin tuberculosis in cattle. It has not, however, been found possible to transmit the condition experimentally, nor to cultivate the organism, so that its rôle in the etiology of skin tuberculosis is not determined.

Although the disease process in tuberculosis is essentially the same, different species may react somewhat differently. This, in part, may be related to the different degrees of resistance shown by individual species. In cattle a pulmonary primary complex is liable to be followed by endogenous progressive broncho-pneumonia, the infection passing from one lobule of the lung to another via the bronchi. Lung lesions in cattle tend, therefore, to be 'open' and, as the characteristic caseation and calcification of bovine lesions begin at the centre and extend outward, there is always the risk that viable organisms may remain dormant at the junction of diseased and healthy tissue. Lesions of this kind may not be progressive and the animal may lose sensitivity to tuberculin. Under conditions of stress, however, the infection may become re-activated and if the stress is great enough generalisation is likely to follow. This is very important in the epidemiology of tuberculosis in cattle and numerous 'break-downs' have occurred in this way. At times, however, the organic lesion of the primary complex appears to be absent or is extremely difficult to find and lesions in the related lymph gland(s) only are evident. There is no evidence that a primary non-progressive lesion in cattle results in resistance to a more severe challenge later. In man, on the other hand, the organic lesion of the primary complex tends to heal and become 'closed'. Further, there is good reason to believe that primary non-progressive infection in man acts like a vaccine and gives protection against a more severe challenge later. This is the basis of the belief that tubercle bacilli in the milk supply was a valuable asset to the human population. Although it is very probably true that a proportion of the population benefited in this way, the large number which succumbed to the disease from this source made safer forms of vaccination desirable.

Different vaccines have been used to protect the human and cattle populations against

tuberculosis. Of these the best known is B.C.G. (*Bacille Calmette-Guerin*). The vaccine is made from a bovine strain of the organism which was sub-cultured for many years in the laboratory. As a consequence the organism lost its capacity to produce disease. This vaccine has given good results when used in man, and claims were made in France that it had been used successfully in cattle as well. Experimental work in other countries gave very variable results. One of the difficulties of its use in cattle is that it is often impossible to ensure the freedom of infection of a young animal in an infected environment during the pre-vaccination period of life and the negative phase following vaccination itself. Vaccines made with the murine strain of the organism have also been tried with varying success.

Unfortunately, vaccines against tuberculosis produce reactions to the tuberculin test and, as they cannot guarantee protection of an animal during its lifetime, it is obvious that vaccination cannot be used in a country where an eradication policy based on the tuberculin test is in operation. Attempts have been made to remove, by chemical extraction, the tuberculin-sensitising fractions from the organism, but little progress has been made with vaccines treated in this way.

TUBERCULIN AND THE TUBERCULIN TEST

During his studies of the effects of the tubercle bacillus in animals Koch came to the conclusion that there was some substance in the organism capable of causing a reaction in those already infected with tuberculosis but not in those which did not have the organism in their body systems. Accordingly he produced a filtrate from a liquid culture of the organism. The culture was heated to destroy all the organisms present, concentrated to one-tenth of its original volume and filtered through porcelain. This filtrate, called 'lymph' by Koch, came to be known a few years later as tuberculin—the celebrated 'old tuberculin' or, simply, OT. In 1890 Koch announced that by injections of tuberculin he had rendered a guinea-pig immune to the tubercle bacillus, while in extensively affected guinea-pigs the disease had been arrested. Later he reported that he had used tuberculin in the treatment and diagnosis of the disease in man. This announcement caused even more of a sensation than the discovery of the organism, but subsequent experience did not support this claim and tuberculin therapy was abandoned. An essential rôle, however, awaited it as a diagnostic agent, for without it eradication of the disease in cattle would not have been possible.

The tuberculin test is based on the principle of allergy. Broadly, the principle as it applies to tuberculosis is that when the organism enters the body and multiplies there it stimulates the production of allergin (antibody) which, when brought into association later with the essential products of the organism, produces the reaction which may be systemic, local or both.

Gutmann in Russia in 1891 is regarded as having been the first to use tuberculin as a

diagnostic agent in cattle; in the same year B. Bang of Denmark reported the results of extensive tests in cattle which had convinced him of the value of tuberculin in diagnosis. Pearson, Cotton and Russell of the USA carried out further work with the test and in 1893 the Bureau of Animal Industry of the United States Department of Agriculture began manufacturing the substance for use in the application of its own quarantine regulations. At this time the test employed was a thermal one and required a series of temperature recordings during the twenty-four hours period following subcutaneous injection of a test dose of tuberculin. The subcutaneous test was time-consuming and liable to fraudulent interference. In 1907 Von Pirquet in Vienna introduced a dermal test for use in humans. This was carried out by abrading the skin and applying tuberculin to the area. The same year Vallé and others used this test in cattle but varying results were obtained, probably resulting from differences in its application. Also in 1907 Wolff-Eisner and Calmette perfected the ophthalmic test in which a quantity of tuberculin was inserted between the eyelids. In positive cases inflammatory reaction with purulent discharge followed. This test was also liable to fraudulent interference. In 1908 Mantoux described an intradermal test in humans and at the same time Moussu introduced a similar test in cattle, and this is now universally accepted as the most satisfactory allergic test so far devised for the diagnosis of tuberculosis in human and veterinary medicine. In Britain the centre of the neck in cattle has been the site of choice but in some other countries, such as the USA, Canada and New Zealand, the caudal fold, although less sensitive as a site, is preferred for convenience in application. Since the tuberculin reaction is related to the presence of tuberculo-protein in the tuberculin, effort was made to produce a tuberculin which was free of protein from the culture medium. Eventually Dorset in the USA produced a heat-concentrated synthetic medium tuberculin similar to OT. In the medium the nitrogen required by the organisms for growth is supplied by one or more amino acids. This tuberculin contains all the products of growth of the organism plus a certain amount of polysaccharide, nucleic acid, glycerol and protein. The term PPD (purified protein derivative) was used first by Seibert in 1934 to describe tuberculo-protein prepared by chemical precipitation from OT. Since then the term has been applied to tuberculins derived from heated culture filtrates. Seibert used ammonium sulphate to precipitate the tuberculo-protein but for large-scale production the method was modified by Green at the Central Veterinary Laboratory at Weybridge where trichloroacetic acid is used as the precipitant.

Mammalian PPD tuberculin produced at Weybridge is from three human strains and is adjusted to 2.0 mg. of PPD per ml. Avian PPD tuberculin is prepared in the same way but is standardised at 0.5 mg. per ml. The reason for the four-fold difference in PPD content between mammalian and avian tuberculin derives from the fact that the relative PPD values of mammalian and avian OT formerly in use were of the same order. Mammalian tuberculin prepared from human strains has the advantage that larger quantities

of tuberculo-protein can be obtained from the same quantity of culture and it has been found in practice that there is no significant advantage in using a tuberculin made from a bovine strain in the tuberculin test in cattle. Certain countries do, however, favour tuberculins made from the bovine strain because of the theoretically greater specificity and there is also variation in the potency of tuberculins used.

After the subcutaneous (thermal) test had been discontinued in Britain it was replaced by a double intradermal test for official purposes. The site of inoculation in the neck was measured in mms. before 0.1 ml. of tuberculin was injected into the deep layer of the skin (dermis). Forty-eight hours later the site was measured again and a further 0.1 ml. of tuberculin was injected there. Twenty-four hours later the result of the test was assessed. In 1940, owing to the high-potency tuberculin then in use, it was found necessary to carry out a test simultaneously with avian tuberculin (the comparative test) to prevent non-specific reactions due to sensitisation by allied organisms from being regarded as indicative of bovine infection. In 1943 PPD tuberculins came into general use in Britain and in 1947 the double intradermal test was abandoned in favour of a single intradermal comparative test after experimental work had shown that the second injection of tuberculin at the forty-eighth hour was unnecessary.

The comparative test is regarded as essentially a herd test rather than one suitable for determining the freedom of an individual animal. On the whole it has given satisfactory results in the countries in which it has been used. Its interpretation, however, must be flexible and adapted to the circumstances in particular cases. A modified double intradermal test known as the Stormont test was developed in Northern Ireland. In this test the second injection is made seven days after the first, and the test is assessed twenty-four hours later. This test, however, is less convenient to carry out than the single intradermal test and is not now used in Northern Ireland for official purposes.

In recent years a modified subcutaneous test called the short thermal test has been used in Australia. It has not been extensively tried under British conditions but in its limited use here it has not been found to be as satisfactory as the intradermal test.

CONTROL AND ERADICATION: THE ATTESTED HERDS SCHEME

The Tuberculosis Order revoked in 1914 was not re-introduced until 1925 so that only for a matter of about fifteen months between 1907 (the date of the Second Interim Report of the Royal Commission) and 1925 was a health authority empowered to take any action with regard to clinically affected dairy cattle, even those with tuberculous mastitis, beyond requiring their removal from a herd. Animals removed in this way often found their way into other dairy herds. Under the Tuberculosis Order of 1925 (later replaced by the Order of 1938) provision was made for the slaughter with payment of compensation for cattle giving tuberculous milk, or affected with tuberculosis of the udder or tuberculous emaciation, or having a chronic cough with definite clinical

signs of tuberculosis. In 1946 another category was added; 'excreting or discharging tuberculous material'. This Order did not, of course, do much to reduce the incidence of tuberculosis in the cattle population—it was intended purely as a public health measure, but it had at least one very important side-effect in that it stimulated many local authorities to set up veterinary services. Accordingly, when the existing veterinary staff of the Diseases of Animals Branch of the Ministry of Agriculture and Fisheries was amalgamated with local authority veterinary services to form the Animal Health Division in 1938, there came into being a cadre of veterinary staff highly experienced both in control of contagious diseases and in veterinary public health.

Naturally the Order did not satisfy veterinary and other propagandists who favoured measures of eradication. This was particularly the case in veterinary circles in Scotland where a Tuberculosis Committee of the Scottish Branch of the National Veterinary Medical Association (now the British Veterinary Association) was formed. In 1929, 15,532 cattle were destroyed under the provisions of the Tuberculosis Order and 2,692 or 18 per cent of the 14,858 cows and heifers included in this total were affected with tuberculosis of the udder or were giving tuberculous milk. In February 1930 the Scottish Branch of the NVMA produced a scheme for the eradication of the disease. The scheme was supported by the Scottish Chamber of Agriculture, the Scottish National Farmers' Union and the Ayrshire Herd Book Society and, in August 1930, the then Minister of Agriculture, Dr J. Addison, received a deputation representing these bodies. The Minister was sympathetic but as the financial implications seem to have been too formidable no action followed. Public interest and concern were increasing, however, and in 1932 the Cattle Diseases Committee of the Economic Advisory Council was appointed to consider measures to reduce disease among milk cattle with particular reference to tuberculosis and improvement of the milk supply. This Committee, which was under the chairmanship of Sir F. Gowland Hopkins, came to be generally known as the Gowland Hopkins Committee.

In its Report (1934), the Committee accepted the widely held view (based mainly on the findings in abattoirs and the results of exploratory tests in 144 herds) that at least 40 per cent of cows in dairy herds were infected with tuberculosis to some extent and that, on the evidence available, at least 0.5 per cent of cows yielded tuberculous milk. It was also stated that bovine tuberculosis was responsible for over 2,500 deaths and for a still larger amount of illness annually among the human population.

While the overall incidence of infection in cows was accepted as being about 40 per cent, it was realised that there was a great deal of variation among herds, even within small areas, ranging from complete freedom to 100 per cent infection. The distribution of cases of clinical disease coming within the scope of the Tuberculosis Order showed that the heaviest infection was in herds situated in or near industrial areas. Many of

these herds consisted entirely of cows which spent their milking lives in the confinement of badly ventilated cowsheds. There was little information on which to base an estimate of the overall incidence of infection in cattle but it was thought to be in the region of 15–20 per cent.

The Gowland Hopkins Committee concluded that the total eradication of bovine tuberculosis was the only complete solution of the problem of tuberculous milk but that the progressive formation of clean areas, based on compulsion at the outset, could not then be undertaken.

The Milk Act of 1934 gave effect to the conclusions of the Committee by making provision for the expenditure of £750,000 over a period of four years to improve the milk supply. As it was obviously impracticable at the time to slaughter reactors as soon as they were identified, the only alternative was to free as many herds as possible under a voluntary scheme so that, at a later date, when the overall incidence of infection had been reduced to manageable proportions, it would be possible to introduce radical measures to get rid of the remainder.

The first Attested Herds Schemes were introduced in 1935. One applied to England and Wales and was administered by the Ministry of Agriculture and Fisheries; the other to Scotland, administered by the Department of Agriculture for Scotland. The schemes were similar and although modified from time to time, to allow of changes in bonus payments, remained essentially the same throughout.

Under the schemes, herds which were free from tuberculosis, as judged by their having passed three consecutive tuberculin tests—the last of which was an official test—at minimum intervals of sixty days, or herds which had been entirely constituted with attested cattle, could be registered as attested herds. Before the official test was carried out the farm was approved as suitable for the maintenance of an attested herd and the owner was required to give an undertaking to observe a number of rules designed to prevent, as far as possible, re-introduction of infection into the herd. A bonus of 1d. per gallon was paid on milk from an attested herd sold through a Milk Marketing Board. The herd was tested at intervals to see that freedom from tuberculosis was maintained. Reactors disclosed at any tuberculin test were required to be isolated at once and removed from the premises within a stipulated time, otherwise the attested registration of the herd was cancelled.

For a time progress was slow and the schemes largely attracted owners whose herds were also licensed to produce 'Tuberculin-Tested' (T.T.) milk under the Milk (Special Designations) Order or those who were already taking measures to free their herds on their own account. At the end of 1936 there were only 414 attested herds and during the same year 23,716 cattle were slaughtered under the Tuberculosis Order, the largest number recorded in a single year. This increase over the number dealt with under the Tuberculosis Order in 1929 does not necessarily mean that the incidence of clinical

ERADICATION OF BOVINE TUBERCULOSIS

Incentives offered in Great Britain in relation to the progress of eradication

NO. OF ATTESTED HERDS AT 31 DEC.	BONUSES PAID TO OWNERS OF ATTESTED HERDS		PREMIUM ON T.T. MILK OR MILK FROM ATTESTED HERDS	YEAR	OTHER INCENTIVES	HERDS ELIGIBLE	NO. OF ANIMALS SLAUGHTERED UNDER TUBERCULOSIS ORDER
	MILK OR	CAPITATION					
99	1d. per gall. for milk sold through a Milk Marketing Board	Nil	—	1935	Nil	All herds	22,237
414				in Scotland (see below)	1936		23,716
1,451					1937		22,425
4,644				In England, Scotland and Wales. Financial assistance with tuberculin tests after herd showed less than 10 % reactors	1938		19,910
13,874		1939	17,686				
16,294		1940	15,501				
16,330		Only T.T. herds accepted	1941		14,212		
16,145			1942		13,480		
16,079			1943		14,360		
16,976			1944	11,747			
20,036	Bonus to complete 3 years as above. No bonus for new entrants	4d. per gall. for T.T. milk 1d. per gall. for milk from attested herd not T.T. or 'accredited'	1945	Nil		9,633	
25,355			1946			8,266	
30,436			1947			6,545	
36,896			1948			6,320	
44,889			1949			5,813	
55,045			1950			5,296	
74,025			2d. per gall. for 4 years and 1d. per gall. for further 2 years			£2 per head for 4 years and £1 per head for further 2 years	2d. per gall. T.T. milk
96,429	1952	2,831					
111,875	1953	2,226					
132,233	1954	1,762					
152,077	1955	1,251					
167,757	1956	1,103					
185,543	1957	800					
209,938	3d. per gall. T.T. milk	1958		350			
236,043		1959		119			
243,933		1960		28			
----- Whole of Great Britain declared attested -----				1961			20
			4d. per gall. T.T. milk	1962			10
			Terminated 30-9-64	1963			7
				1964			7

tuberculosis rose between these years. It is more likely to have been the result of the increased number of clinical examinations of herds carried out following the expansion of veterinary services of local authorities during this period.

At the same time it was clear that progress could not be made without adequate marketing facilities for attested stock and, as the need arose, markets were approved for the holding of sales of attested cattle.

In 1937 a very important step was taken when the Agriculture Act of that year empowered the Minister of Agriculture and Fisheries to expend money on the eradication of bovine tuberculosis and other diseases of animals and to declare eradication areas for that purpose. The schemes were now extended to beef and rearing herds as well as to dairy herds.

In 1938 the schemes of 1935 were replaced by a single Attested Herds Scheme applicable to the whole country and administered by the Ministry of Agriculture and Fisheries. The new scheme made provision for the payment of a bonus of £1 per animal per year for a period of three years as an alternative to 1*d.* per gallon of milk for the same period.

At the end of 1938 the number of attested herds had risen to 4,644 and during the year the number of animals slaughtered under the Tuberculosis Order had fallen to 19,910.

During the period August 1938 to September 1939 a tuberculin test survey was carried out in 12,300 self-contained herds containing 364,286 cattle and the incidence of reactors was found to be 13 per cent: 6,971 herds (127,141 cattle) showed no reactors; of the herds with reactors, 2,897 (114,701 cattle) had less than 10 per cent and 2,432 (122,444 cattle) had more than 10 per cent. The reactor incidence cannot be taken as a true indication of the position at this time as the herds in the survey were selected on the basis that they were self-contained with little or no history of clinical tuberculosis.

The outbreak of war in 1939 undoubtedly hampered progress as, for the greater period of hostilities, it was found necessary to restrict attestation to herds which were licensed to produce 'TT' milk. On the other hand it is possible that as a result of shortage of foodstuffs during the same period many animals, unthrifty as a result of tuberculosis, were disposed of for slaughter and so reduced to some extent the overall weight of infection.

In October 1943 the Ministry of Food made payable a premium of 4*d.* per gallon on milk from licensed 'TT' herds and many herds which qualified for 'TT' licences became attested in due course.

The Attested Herds Scheme was fully re-opened in July 1944 but, since no corresponding bonus was payable to non-dairy herds, it was inevitable that attestation should progress largely in areas in which dairy farming was the main agricultural activity.

At the end of 1947, 1,200,000 cattle, about 14 per cent of the total population, were in attested herds (Scotland 32 per cent, Wales 26 per cent and England 8 per cent). During that year the number of cattle slaughtered under the Tuberculosis Order fell to 6,545. The proportion of those animals affected with tuberculosis of the udder or giving tuberculous milk remained fairly constant at 30 per cent during the ten-year period, 1938-47. By the end of September 1950, 2,042,000 cattle, comprising 22 per cent of the bovine population, were attested. Five thousand cattle were slaughtered under the Tuberculosis Order during the first nine months of 1950.

AREA ERADICATION PLAN

In October 1950 it was decided to introduce a plan of area eradication which had been under consideration during the post-war period. The necessary legislative measures—the Tuberculosis (Area Eradication) Order; the Tuberculosis (Slaughter of Reactors) Order and the Tuberculosis (Compensation) Order—were taken under the provisions of the relevant sections of the Agriculture Act of 1937 which by now had been incorporated in the Diseases of Animals Act 1950.

The concept of the plan was to select areas in which the percentage of attested cattle under the voluntary schemes was already substantially high and which were reasonably self-sufficient as regards stock replacements and marketing facilities. After consultation with local interests notice would be given that, on a determined date, the area concerned would be declared to be an eradication area. In an eradication area all herds not already subject to the rules of the Attested Herds Scheme on the date of declaration would be placed under movement restrictions and tested with tuberculin, compulsorily if necessary, with immediate slaughter of reactors and payment of compensation. When all such herds had been tested twice and reactors disposed of, the area would be declared to be an attested area. During the period of notice of intention to declare an eradication area—in practice the period was two years—the State would pay the cost of tuberculin testing of herds not already attested to bring them up to that standard, provided the owner carried out the Ministry's requirements regarding disposal of reactors. Each successive year further areas, in which voluntary attestation of herds showed the highest rate of progress, would be selected for eradication and in turn dealt with in the same way, until eventually the whole country would become one large attested area.

In October 1950 the Attested Herds Scheme was modified to provide for payment to attested herd owners of a bonus of 2*d.* per gallon of milk for a period of four years and 1*d.* per gallon for a further two years, or a capitation bonus of £2 and £1 for the same periods. At the same time the first areas, one in south-west Scotland and one in south Wales, were selected for eradication in 1952. At the end of 1951 there were about 74,000 attested herds containing nearly 3 million cattle or 31 per cent of the

population: 3,771 cases were dealt with under the Tuberculosis Order during the year.

In the Isles of Scilly, Arran, Cumbrae and Shetland voluntary attestation had already progressed so far that it was possible, without an intervening eradication stage, to declare them attested areas on 1 February 1951—the first in Great Britain. Each year new areas were selected according to the plan so that, from 1952 onwards, eradication areas were declared every year with the exceptions of 1953 and 1956. Scotland and Wales became attested areas in October 1959.

At the end of 1959, 95 per cent of cattle were in attested herds and during the year 119 animals were found to come within the scope of the Tuberculosis Order; in 1960 the number was 28.

On 1 March 1960 the last eradication areas, comprising counties in the Midlands and north and east of England, were declared. These areas were declared to be attested areas on 1 October 1960 when the whole of Great Britain became one attested area.

The plan went smoothly from the beginning; no serious difficulties were encountered and the great majority of owners readily co-operated. In all, 9,695 herds (174,607 cattle), not subject to the Rules of the Attested Herds Scheme when eradication areas were declared, were included in the first round of compulsory tests under the plan; about 50 per cent of these herds showed no reactors. In herds showing reactors the incidence ranged from 0.5 to 30.5 per cent; the incidence of reactors in cattle tested was 17.5 per cent which tends to confirm the earlier estimates of the overall incidence in non-attested cattle.

TUBERCULOSIS IN OTHER SPECIES

Tuberculosis in mankind is even now probably the most important world public health problem. Human infection by the bovine strain of the organism is most commonly acquired through infected milk. Accordingly, the first infection is usually during early life and dissemination outside the lungs is most likely. Pulmonary tuberculosis due to the bovine strain may take place either by spread from a tonsillar or intestinal lesion or by direct infection from cattle. The Gowland Hopkins Committee concluded that bovine tuberculosis was responsible for over 2,500 deaths annually among the human population. In 1937 it was found that about 50 per cent of tuberculous adenitis and dermatitis, and 20–25 per cent of meningeal, bone and joint, and other non-pulmonary tuberculosis lesions were due to the bovine type of organism. The percentages in children under five years were considerably higher. At this time about 0.5 per cent of dairy cattle were secreting the organism in their milk.

With increasing control of tuberculosis in cattle the incidence of bovine strain pulmonary infections in children and adolescents fell from 13 per cent in 1954 to 4 per cent in 1957 and now that the incidence of reactors among cattle is in the region of

0.06 per cent the incidence of new human infections from cattle must be very low indeed.

The pig is susceptible to all three strains of the organism but generalisation is usually associated with the bovine strain. Pigs almost invariably become infected from cattle, and there has been a progressive decline of the incidence in this species in parallel with the reduction of incidence of the disease in cattle. It is probable that bovine infection in pigs will eventually disappear.

Tuberculosis in dogs and cats was never common. In the former it was usually associated with human strain infection although the bovine strain was sometimes involved. The converse was the case in the cat, which usually became affected by drinking infected milk. With control measures in man as well as in cattle, tuberculosis in dogs and cats is also likely to disappear.

Sheep and goats are both susceptible to tuberculosis although only rarely has the disease been recorded in them. This may be because both species are not ordinarily subject to the same stresses as are cattle. Naturally occurring outbreaks of the disease have been recorded in herds of goats and at times the avian strain of organism has been involved. In sheep the infection has been found in rare individual cases and the animal concerned was usually an orphan which had been reared on milk from an infected cow.

Tuberculosis in horses was always uncommon and when it did occur it was usually from a bovine source.

ERADICATION AND THE FUTURE

Although the term 'eradication' was used by the Gowland Hopkins Committee it is doubtful whether this can be achieved with tuberculosis in the literal sense; at any rate it is unlikely to be achieved during this century. Experience during eradication showed that it was easy to reduce the incidence from a high level down to one per cent but reduction to a level below this takes a good deal longer; thus, between 1960 when the whole country became an attested area and the end of 1964, the incidence of reactors had fallen from 19 in 10,000 to 6 in 10,000. Although the fall may not be spectacular it does mean that a considerable amount of residual infection has been eliminated. There still remain, however, considerable numbers of cattle which were in herds before eradication measures were begun and it is to be expected that a proportion, at least, are affected with inactive lesions, although viable organisms are still present. Some animals of this kind lose their sensitivity to tuberculin after a time and the disease may become active again following some stress. When this happens the infection is very liable to spread to many other animals in the herd. Furthermore, human beings who were infected by the bovine strain when the disease was common among cattle may re-infect herds with which they have contact, and incidents of this kind have increased in Britain

and other countries where the disease has been eradicated among cattle. It is extremely important, therefore, that herds should continue to be tested with tuberculin at appropriate intervals, and reactors removed, otherwise the disease might easily become re-established in the national herd.

BRUCELLOSIS

DURING the nineteenth century, abortion in cattle was common in most countries that had expanding dairying industries. In Great Britain it was so prevalent in 1886 that a question was asked in Parliament as to the advisability of bringing it under the Contagious Diseases (Animals) Act. There was at this period considerable disagreement as to the cause of outbreaks of abortion; some contended that the condition was contagious, others that it had a 'sympathetic' basis, and nothing more was done at this stage except that the Highland and Agricultural Society of Scotland appointed a committee to investigate. The Committee recorded the successful transmission of the disease in two cattle and two sheep by transferring swabs from the vaginae of cows which had aborted, to healthy animals. In 1895 Penberthy gave an account of the incidence of abortion in farm animals from the beginning of that century. Two years later Bang, working in Denmark, put an end to all theorising on the etiology of the disease by showing that abortion in cattle was caused by a specific organism (Bang's bacillus) and he demonstrated, by staining and by cultural methods, the presence of the organisms in the placenta of the dam and in the stomach contents of the aborted foetus. Bang and Stribolt succeeded in transmitting the disease by intravaginal inoculation of healthy cows with pure cultures.

In 1905 a departmental committee was appointed by the Board of Agriculture and Fisheries to enquire into epizootic abortion and its first reports appeared in 1909 and 1910. A great deal of experimental work was done by the Committee on the incidence, transmission and methods of diagnosis of the disease and, as a result, a number of recommendations were made which included the compulsory notification of suspected cases, the temporary isolation and restriction of the movement of affected cows, and measures to prevent the introduction of the disease from abroad. The Committee's development of the agglutination and complement-fixation tests for the diagnosis of the disease before abortion occurred was a great step forward, particularly in regard to the control of the infection within a herd. Along with this control, work proceeded to try to evolve a satisfactory method of vaccination. At this period it was thought that the disease was essentially a temporary infection of pregnant cows leading to abortion and that the bull played a major part in its transmission. Subsequent work was to show that although most cows only abort once, many become chronic carriers

excreting the organism in the milk; the bull plays a comparatively small part in the transmission.

In 1918 Alice Evans showed that there was a close antigenic and cultural relationship between Bang's bacillus, *Micrococcus melitensis* (the cause of undulant fever in man, first isolated in 1887 by Bruce), and the causal organism of abortion in sows. Two years later, Meyer and Shaw grouped these three infections in the genus *Brucella*, so named in honour of Bruce. In 1921 Bevan showed that *Br. abortus* could also cause undulant fever in man. It thus became evident that brucellosis had a public health aspect.

Official interest was concerned in the field with the incidence, treatment and control of the disease in cattle and in other species, particularly in the horse. Research centred on development and production of vaccines, evaluation and standardisation of diagnostic tests, typing and classification of brucella cultures, and work on the pathogenesis of brucellosis including the distribution of *Br. abortus* in the tissues of infected cows, the duration of excretion in milk and methods of the transmission of disease.

Control of brucellosis constituted an important aspect of the work of the Ministry and involved a number of statutory provisions. The first of these, made under the Diseases of Animals Acts, was the Epizootic Abortion Order of 1922, under which certain restrictions were placed on the movement and sale of cows and heifers for a period of two months following premature calving. Later the Brucellosis Melitensis Order of 1940 was introduced following the recovery of a culture with biochemical and serological properties indistinguishable from *Br. melitensis* from cows' milk on a farm in Staffordshire in 1940. The Order provided for the slaughter, with payment of compensation, of infected and in-contact animals. No case of undulant fever in man was traced to the ingestion of raw milk from cows infected with this British *melitensis* and work done more than twenty years later showed that the British *melitensis* strains differed in other important respects from the Mediterranean strains of *Br. melitensis*. The Order and an Amendment Order of 1942 which added horses, asses and mules to the animals affected by the Order have not been invoked since 1956.

Provisions exist under the Milk and Dairies (General) Regulations 1959 and the Food and Drugs Act 1955 for the prohibition of the sale of raw milk where it is known or suspected to be infected with a disease communicable to man until such milk is rendered safe by heat treatment.

Work on the reactor aspect was initiated largely by M'Fadyean at the Royal Veterinary College, and vaccination was investigated at the Research Laboratory of the Board of Agriculture and Fisheries at Alperton.

The success of control by test and elimination of reactors depended very largely on the development of a serum agglutination test. It involved frequent blood testing and in some herds the method was successful. In other cases it entailed dividing the farm into two parts—one for the clean and one for the infected animals. In 1933 the Brucellosis

Committee of the Agricultural Research Council began limited trials of an eradication scheme based on this method. It was at this time that a dried reference standard serum was introduced by Stableforth for preparing antigens of uniform agglutinability so that results in different laboratories could be properly compared. Although this was not an official project, the results after five years were sufficiently promising for additional laboratories to be built at Weybridge to expand this work; the project had to be stopped, however, at the outbreak of the Second World War. The method, used as it was on a limited scale, did not lead to any marked reduction in national incidence and it left the herds free of brucellosis but very vulnerable to the accidental introduction of the disease.

Control by vaccination, as already noted, began with the work of the 1905 Departmental Committee when it was shown that non-pregnant cattle did not develop adverse symptoms following the inoculation of virulent cultures and, in small-scale experiments, such cattle were protected against abortion following experimental challenge. Since that time the production, evaluation and issue of brucella vaccines have been important aspects of the Ministry's work on brucellosis. One of the difficulties encountered in the early days of vaccination was that of obtaining sufficient growth of cells, because brucella strains are slow growing. This obstacle was overcome when Stockman (1914) discovered a potato infusion agar medium which gave excellent growth. Indeed, at that time, the vaccine issued consisted of cells grown for three weeks on potato agar in medicine bottles, the veterinary surgeon adding 30 ml. of saline to emulsify the growth which was then filtered to remove extraneous matter and injected. From 1918 until 1942 this living vaccine (the anti-abortion 'A' vaccine) consisted of virulent cells grown in a liquid medium. The use of this vaccine was only allowed in non-pregnant animals at least two months before service in herds already shown to be infected. Its use was not permitted in non-infected or in 'tuberculin-tested' herds. Some 25,000 doses were issued each year from Weybridge. The anti-abortion 'B' vaccine, consisting of heat-killed cells, was used for pregnant cows, monthly up to the sixth month of pregnancy, but it was found to be ineffective and its use was discontinued.

There was no deliberate choice of any particular strain for vaccine production and the strains used as a rule were virulent. The wisdom or otherwise of using such strains as living vaccines was discussed at length in the 'thirties by Andrews, M'Fadyean, Minnet and others. The case for continuing with vaccination was put by Andrews in 1932 and 1933 who, whilst admitting that it was not the ideal method, contended that its use, with the restrictions which were then in force, had contributed to the control of abortion in many of the herds in which it had been tried.

Work done in the USA just before the war had shown that a strain of reduced virulence known as Strain 19 possessed good immunising properties when inoculated into

calves aged between four and eight months. Strain 19 was brought to this country in 1940 and work was started on its production for routine use in herds. Much of the work on the stability of Strain 19 and the degree and duration of immunity was done under the auspices of the ARC Committee on Brucellosis at Compton, Berkshire, where a large scale experiment showed that calfhood vaccination with Strain 19 was effective for five lactations and that re-vaccination was not necessary.

In 1942 the issue of the anti-abortion 'A' vaccine ceased and the only living vaccines issued were Strain 19 and Strain 45/20, both suspended in buffered saline.

The latter vaccine was developed by McEwen at Wye from an avirulent Strain 45 by passage in guinea-pigs. Two injections of the living cells conferred good protection in guinea-pigs and the strain had the considerable advantage in that it was non-agglutinogenic and therefore the question of residual titres did not arise. This vaccine was issued from Weybridge between 1942 and 1944. Experiments in cattle, however, showed that the strain was not completely stable and could mutate to a fully virulent culture and consequently it was withdrawn from use in 1944.

In June 1942 a Scheme for the Control of Diseases of Dairy Cattle (the 'Panel' Scheme) was introduced for the control of contagious abortion, mastitis, infertility and Johne's disease. As far as brucellosis was concerned, the Ministry undertook to provide free laboratory facilities for diagnosis and to supply anti-abortion vaccine free of cost. The scheme lost much of its attraction by the introduction of the Calfhood Vaccination Scheme in December 1944 and was terminated on 1 October 1950. The Calfhood Vaccination Scheme was a large-scale voluntary project using Strain 19 for the vaccination of heifer calves of four months of age and upwards and including maiden heifers up to the time of first service. It applied to animals in registered dairy herds, the charge to the farmer being 1s. *od.* per head, later increased to 2s. *od.* and then, in 1955, to 2s. 6*d.* The scheme did not provide for the vaccination of adult animals although this was widely done and, indeed, encouraged.

During the very early stages of the Calfhood Vaccination Scheme a number of complaints were made that vaccination caused infertility. Breakdowns were also reported and, accordingly, large-scale laboratory and field investigations into the use of Strain 19 on about fifty farms were carried out from Weybridge. These investigations covered the course of serum titres after vaccination at different ages, local and general disturbances and the effect of repeated vaccinations. These observations were of considerable value not only in showing the effectiveness of vaccination but also in gaining the confidence both of veterinary surgeons and farmers in the use of the vaccine.

In 1945 about 200,000 calves and maiden heifers were vaccinated under the scheme, and by 1960 this had increased to 423,000, representing just under half of the total number of calves eligible.

On 1 May 1962 the Free Calf Vaccination Service was introduced, applying only to calves between 151 and 240 days of age. Calves so vaccinated were identified by a caudal-fold tattoo mark. Large-scale experiments had shown that vaccination at this age conferred as good an immunity as when done at a later stage of life and had, further, the considerable advantage that post-vaccinal agglutinins were much less of a problem than in animals vaccinated when mature. The Service was modified on 1 November 1964 and the lower age range was increased to allow vaccination between 121 and 240 days of age. The caudal-fold tattoo, which had been criticised, was replaced by a special tamper-proof ear tag.

To return to 1934: the Economic Advisory Council Committee on Cattle Diseases reported that abortions occurred in more than 40 per cent of the herds surveyed and that nearly 9 per cent of cows in these herds aborted in the course of a year. Doyle (1936) reported a 35 per cent incidence of herd infection in south-east England.

A survey in 1934 for the presence of brucella agglutinins in pigs' blood found that four sera out of 10,474 examined had positive titres (1/100). In 1952 a further survey of 1,552 swine sera, as well as the cultural examination of foetuses, revealed no evidence of brucellosis.

Br. abortus was isolated in 1933 and 1937 from cases of fistulous withers and poll evil in horses. In an extension of this work it was shown that 80 per cent of unopened lesions were culturally positive for *Br. abortus* and that nearly all cases had contact with cattle. The use of a dead vaccine in horses showing positive serum agglutination titres led to recovery, with or without surgical interference, in over 70 per cent of the cases. About 500 doses of this dead vaccine were issued annually from Weybridge for use in horses showing positive titres during 1938 to 1947, after which the number decreased progressively until only twenty-four doses were issued in 1960.

A later national survey of disease in dairy herds showed that, in 1957-58, the estimated incidence of abortion from all causes was 2.06 per cent and the incidence of stillbirths 1.78 per cent, making a total of 3.84 per cent. On the other hand it was reported that the Ministry's veterinary laboratories were able to recover brucella from less than one-sixth of foetal samples submitted for examination. While samples obtained in this way may not have been truly representative of the position in the national herd, these findings suggest that possibly no more than 0.5 per cent of all bovine pregnancies end in abortion associated with brucella.

With regard to milk infection, it was reported that 18.5 per cent of 3,108 bulk milk samples examined by the Ministry's veterinary investigation centres in 1951-52 were infected. To obtain a clearer picture of the incidence of the disease a detailed survey was conducted by the Ministry, in conjunction with Rothamsted Experimental Station, in 1960-61. This revealed that 25 to 30 per cent of dairy herds in Britain were

infected and that just over 2 per cent of cows were infected. In 62 per cent of these herds only one or two infected cows were found (based on cultural examinations of milk and smear examinations of placentae). Preliminary results of a survey undertaken in 1964 indicate that about 20 per cent of cows in Britain gave a positive or doubtful reaction to the serum agglutination test for brucellosis, and 14 per cent were positive when the doubtful reactors were checked by complement-fixation test.

An increasing amount of research on various aspects of brucellosis has been done by the Ministry's laboratories over the years and the following pages cannot do more than summarise very briefly the work done.

The search for a vaccine consisting of killed cells, with its many obvious advantages, has been going on since the beginning of the century. It was soon discovered that a vaccine consisting of killed cells in saline conferred little or no protection. Because of the cost of such experiments in cattle, a great deal of work was done by Doyle (1939) on the susceptibility of goats to experimental infection with *Br. abortus* and it was shown that they were susceptible to conjunctival challenge. Between 1938 and 1949 work was carried out by Gilbert and by Stableforth on the use of adjuvant vaccines (killed 'smooth' cells in a suspending vehicle composed of 5 per cent lanolin in liquid paraffin). The initial screening was done using goats and only the most promising vaccine was tested in cattle. The disadvantage of the adjuvant vaccine was that it produced a persistent local reaction at the point of inoculation. It was also shown that killed 'rough' cells incorporated in such an adjuvant gave protection in goats against *Br. abortus* infection. This was of considerable importance since the vaccine did not give rise to antibody production. This work was confirmed by McEwen and Samuel, who showed that the Strain 45/20, incorporated in adjuvant, gave good protection in guinea-pigs, and by work at Weybridge using both smooth and rough cells of *Br. melitensis* incorporated in adjuvant. These gave good protection in goats against experimental challenge with *Br. melitensis*. Further work at Weybridge and Compton, under the general direction of the ARC Committee on Brucellosis, confirmed that such cells incorporated in 'water-in-oil' adjuvants gave good protection. In cattle, one dose of vaccine gave little protection, two doses gave good protection, whilst three doses again gave no protection. The problem of persistent local reactions still remains however. Oil-in-water adjuvant vaccines, which give a much less severe local reaction, produce a poor degree of immunity. There are evident advantages of a vaccine consisting of killed cells in a suitable vehicle, which confers good protection and at the same time does not stimulate production of antibodies which interfere with serological diagnosis. Work is still progressing on such a vaccine.

From 1942 until 1962 the Strain 19 vaccine issued from Weybridge consisted of liquid vaccine grown on Roux flasks of potato agar. From about 1950 onwards much work was done to develop methods, firstly for the growth of Strain 19 by continuous

culture, and secondly to develop techniques for the freeze-drying of the product in sufficient quantities. One of the difficulties of growing any brucella strain in a liquid medium is the tendency to dissociation and the final vaccine must not contain more than 5 per cent of dissociated colonies. The problem in freeze-drying was to obtain a vehicle which would maintain a satisfactory level (about 75 per cent) of viability after drying and also would permit easy reconstitution of the dried product. Since May 1962 the vaccine issued from Weybridge has been the freeze-dried product grown by continuous culture.

So that all serum agglutination test results would be comparable throughout the world the standardisation of the agglutinating suspension against a dried reference antiserum was introduced in 1933. This Standard was adopted by the *Office International des Epizooties* in 1937 and later by the FAO/WHO Expert Committee on Brucellosis. In 1952 a new batch of serum, equivalent in potency to the original standard serum, was prepared at Weybridge and was established by the WHO Expert Committee on Biological Standardisation as the International Standard anti *Br. abortus* Serum; the unitage system of interpretation was introduced in 1954. This International Standard Serum is held at Weybridge and distributed to laboratories throughout the world for the standardisation of antigen for the serum agglutination, complement-fixation and milk ring tests. This now forms a large part of the work on brucella at Weybridge. In 1963, 703 litres of Standard *Br. abortus* antigen and over 17 litres of brucella ring test antigen were produced.

Although the complement-fixation test was used by the 1905 Departmental Committee for use in diagnosis, it was not until the last decade or so that the value of this test was appreciated, especially in differentiating vaccination from infection titres and also as a supplementary test in diagnosis, especially in animals with suspicious or even negative titres. Doyle in 1936 recorded the isolation of *Br. abortus* from the milk of two cows that gave negative serum agglutination reactions. A great deal of work has been done at Weybridge on the use and standardisation of the test and in the interpretation of the result in terms of the International Standard Serum.

The use of milk for serological testing has been increasingly employed because of the ease with which samples can be obtained, and a considerable amount of work has been done in evaluating the milk ring test, whole-milk plate test, whey plate and whey tube tests in animals and herds of known brucella status.

The isolation of brucella cultures from such material as foetuses, placentae and milk samples is proof of infection, and in recent years improved selective media have been evaluated and recommended for routine use. This has greatly facilitated isolations, especially from milk samples, and such a medium was universally used during the recent Brucellosis Survey conducted by the Ministry.

The realisation during the study of the pathogenesis of brucellosis that many cows become chronic carriers of brucella led to much research on the persistence of *Br.*

abortus in the tissues of cattle. Doyle in 1935, examining the tissues of naturally infected cows, found that the supramammary lymph node was positive in 64 per cent of cases and the iliac lymph node in 52 per cent. This work has been amply confirmed by subsequent workers. It was believed that infected cows excreted brucella in the milk immediately after calving and that excretion then became intermittent and often ceased. Recent work at Weybridge has, however, shown that the majority of infected cows excrete brucella in the milk continuously and over many lactations. Work on the possible transmission of brucellosis by milking machines showed that over a period of up to three lactations it was not transmitted from infected to non-infected controls. Work on the fate of *Br. abortus* in calves, by feeding with infected milk or after intravenous inoculation, showed that they did not become infected. After intravenous inoculation of calves with virulent cultures, a high degree of immunity was established.

Typing and classification of brucella cultures has been of great importance in order to establish whether brucellosis due to species other than *Br. abortus* occurred in Britain, and also to distinguish between vaccine and challenge strains.

Since 1958 work carried out at Weybridge on the use of brucella phages¹ has shown that cultures of British *melitensis* differ from the classical Mediterranean strains of *Br. melitensis* in that the former are lysed by phages. This has enabled the British and Mediterranean strains to be distinguished by laboratory tests. A Subcommittee on the Taxonomy of Brucella (appointed in 1958 by the International Association of Microbiological Societies) recommended that the names of the three species *Br. melitensis*, *Br. abortus* and *Br. suis* should be retained, species designation being confirmed by oxidative and phage tests. Consequently, cultures of British *melitensis* were redesignated *Br. abortus* biotype 5, and all cultures of brucella found in Britain belong to *Br. abortus* or one of its biotypes.

Standard strains must be included for typing purposes and Strain 544 of *Br. abortus*, which has been studied and used extensively since the work of McEwen, was adopted as the FAO/WHO reference strain.

In 1950 Weybridge was designated one of the twelve World FAO/WHO Brucellosis Centres.

BOVINE MASTITIS

BEFORE 1914 little was done on a national basis to produce clean milk from mastitis-free cows. A few producers had made some effort to supply a hygienic product but it

¹ Bacteriophages, or phages, are specialised viruses capable of infecting bacteria and destroying them by lysis. They are highly specific for their host bacteria and may be used not only to identify species but to differentiate between strains of an individual species.

was only after considerable pressure from many quarters, including the medical and veterinary professions, that the need for improved methods of production and distribution of milk supplies was fully appreciated.

The first real attempt to improve the national milk supply was contained in the Milk and Dairies (Scotland) Act of 1914. This made provision for the local authorities to appoint veterinary inspectors to make periodic inspections of dairy cattle to ensure that only healthy cattle were used for milk production. In this context mastitis was a disease whose existence meant automatic removal of the affected cow from the herd until the symptoms had subsided, and this undoubtedly focussed the attention of farmers upon its importance as a disease of dairy cattle of economic significance.

Similarly, the Milk and Dairies (Consolidation) Act, covering England and Wales, was published in 1915 but, owing to the First World War, its operation was temporarily suspended and it did not come into force until 1925 following the passing of the Milk and Dairies (Amendment) Act of 1922.

As with the 1914 Act, much of the power in these Acts was vested in the local authorities, but this was changed completely with the passing of the Food and Drugs (Milk and Dairies) Act in 1944.

This important Act transferred most of the responsibilities for the Milk and Dairies regulations to the Minister of Agriculture and Fisheries who was now called upon to keep a register of all milk-producers and to issue licences for the production of the various designated milks.

In effect, many of the powers under the Act of 1944 were transferred by an Order made under Section 72 of the Agriculture Act of 1947 to the County Agricultural Executive Committees for the local administration of the various regulations. The Animal Health Division is represented on these committees with responsibility for any disease problems which arise. Before this, of course, with the merging of the county veterinary services into the Animal Health Division in 1938, the responsibility for clinical inspections of dairy cattle had been assumed by the Minister of Agriculture.

Bovine mastitis has been of direct interest to the State Veterinary Service since the Report of the Gowland Hopkins Committee in 1934.

While the main recommendations of that report were concerned with the eradication of bovine tuberculosis, it was suggested that there should be an extension of the mastitis diagnostic services throughout the country and that this should be provided by the Ministry. The cost was to be recovered by imposing a charge on farmers but the service would only be available through practising veterinary surgeons.

A diagnostic service was already available in certain areas through the local veterinary investigation centres but these were not at that time part of the Ministry service. Work on mastitis by the Animal Health Division really started with the appointment of

Dr A. W. Stableforth as Head of the Bacteriology Department at Weybridge in 1939.

Great stimulus to the work on mastitis was given by the publication in 1941 of the Report on Diseases of Farm Livestock by a committee of the NVM^A (later the BVA). This report dealt with the four diseases of contagious abortion, sterility, Johne's disease and mastitis in cattle and led to the Panel Scheme in the following year. Considerable attention was paid to the economic importance of mastitis with the loss of milk alone estimated at £3 million annually. In terms of food denied to the nation (a most important factor in time of war) it was calculated that mastitis resulted in a loss of 20,000 tons of solids-not-fat and 8,000 tons of butter-fat each year.

The report considered that 80-90 per cent of all cases of mastitis were due to infection with *Streptococcus agalactiae* and that the remainder were due to staphylococci, *Corynebacterium pyogenes*, *Streptococcus dysgalactiae* and *Str. uberis*. This is very similar to the evidence published by the Gowland Hopkins Committee.

Measures of control were discussed, including methods of diagnosis and treatment, but these were chiefly concerned with *Str. agalactiae* infection.

Farmers were advised to use the fore-milk cup or strip-cup as a rough and ready method of diagnosis, and it was recommended that the veterinary surgeon in practice should carry out a careful clinical inspection of the cattle, supplemented by bacteriological examination of milk samples from doubtful cases. It was considered, however, that the only certain way of detecting all infected cows was by examination of individual milk samples from all cows in the herd. It was recognised that the facilities for such herd examinations were limited and that they were very costly.

Two methods of treatment were advocated; for acute cases, the oral administration of drugs of the sulphonamide group, and for the less severe or more chronic cases, udder irrigation with a solution of acriflavine.

Finally the Committee recommended regular veterinary examination of all dairy cows every three months to facilitate early diagnosis of mastitis so that adequate control measures could be adopted.

The essence of the Panel Scheme was that the farmer and his veterinary surgeon jointly undertook to carry out the approved methods of treatment and prevention. Within the scheme the Ministry granted free laboratory diagnostic services and also provided sulphanilamide at greatly reduced cost for the treatment of suitable cases.

The scheme was never really popular either with the farmer or the veterinary profession and it gradually came to an end. Nevertheless, as has been said, the scheme was not without considerable merit as the precursor of herd preventive medicine.

In 1950 the first of a series of pilot surveys of cattle diseases was started. In general these were confined to two or three counties and lasted for two to three years but some were conducted for shorter periods in single counties.

Inevitably, with surveys of this nature which depended, so far as mastitis was concerned, on the diagnostic ability of the farmer or his cowman, there was the possibility that some cases would be missed, but the results published were remarkably consistent and gave figures for clinical mastitis of an annual incidence of 10·1 per cent, 14·5 per cent and 8·8 per cent for the years 1952-53, 1953-54 and 1954-55. The higher figures in 1953-54 were due to the extremely severe outbreak of summer mastitis which occurred during the late summer months of 1954.

In 1957-58 a much more elaborate survey on Disease, Wastage and Husbandry in the British Dairy Herd was carried out by the Animal Health Division. In this survey a total of 1,150 herds and 31,228 cows, representing approximately one per cent of the national herd, were included. The annual incidence of clinical mastitis was recorded as 10·5 per cent, a figure very much in agreement with those obtained in the earlier, more limited, surveys.

The surveys followed the disease history of selected herds for a whole year, and the farmer was necessarily responsible for much of the information obtained. To determine the incidence of sub-clinical mastitis, a different method had to be used. A special survey was carried out in which all the herds in a certain area were visited once, a clinical examination made, and milk samples taken for bacteriological examination and estimation of the cell-count. On this occasion disease was diagnosed by a veterinary investigation officer and was therefore more accurate. It was found that at any one milking 25 per cent of the cows were affected with sub-clinical mastitis, which was considered to exist if the udder was affected with mastitis pathogens and if this was associated with a marked increase in the cell-count.

In recounting the work which has been done at Weybridge on mastitis it is most convenient to deal with it under the different forms in which it is recorded. It must be remembered, of course, that at the same time much research was being done in other institutes.

MASTITIS DUE TO *Streptococcus agalactiae*

When penicillin first became available it was scarce and expensive, but it seemed to be the complete answer to *Str. agalactiae* infection. It was a very active bactericide, non-toxic, non-irritant in the udder and did not give rise to resistant strains *in vivo*.

Attempts were made in those early days to determine the best method of treating mastitis with penicillin, bearing in mind the cost and the relative efficacy of the various treatments. Different treatment schedules were used and it was found that it was not so much the size of the dose as the length of time that a bactericidal level of penicillin was maintained in the udder that was important in effecting bacteriological cures.

While much of the initial work at Weybridge was carried out in commercial dairy

herds, a small herd was established for experimental purposes at the laboratory with cattle purchased from the Institute for Research on Animal Diseases, Compton. These animals, of known disease history, were mainly heifers but also included some second-calvers and a few older cows. The herd enabled studies on mastitis to be carried out in greater detail and under much stricter control than was possible in the field. Initially it was used to study the mode of spread of *Str. agalactiae* through a herd when infection was introduced on the hands of the milkers. The cows were hand milked. It was shown that infection spread rapidly but that heifers were more resistant to infection than older cows.

A similar experiment was carried out in which the herd was machine milked, the clusters being dipped in infected milk before the cows were milked; again infection spread through the cows but not so readily as with hand milking.

The possibility of immunising cattle against *Str. agalactiae* infection was considered at a very early stage. During the first transmission experiments a number of vaccinated cows were exposed to challenge. The results were most disappointing and gave no indication that vaccination was of any value.

A considerable amount of work on the ecology of *Str. agalactiae* was done and it was shown that its usual habitat was in the cow's udder. It could multiply in teat-sores but not on the intact skin. It was not found in other parts of the cow or in other animals although it was occasionally found in the throats of people who drank infected milk.

Because of its limited habitat and the sensitivity of the organism to penicillin it seemed possible to eradicate this infection from a herd by treatment.

When the first attempt was made to eradicate *Str. agalactiae* from a badly infected experimental herd at Weybridge, a dose of 100,000 units of penicillin in an aqueous solution was introduced to each quarter of every cow daily for five days. In addition, because of the contamination of the environment and of the cow's skin, a general disinfection of the cows and the cowshed and utensils was carried out on the last day. This treatment was most successful and a herd which had been heavily infected was freed within a week and remained so until intentionally re-infected during another experiment.

This was the start of the familiar 'blitz' treatment of *Str. agalactiae* with penicillin. The procedure has been modified with the passage of time. In the present method infected cows only are treated and only two, or, at most, three treatments per quarter are given, usually with a two-day or three-day interval between treatments. It has also been shown that there is no need to carry out the disinfection of cows and buildings on the last day of treatment. The advantage of controlling the spread of infection during milking was demonstrated in a series of experiments which showed that eradication of infection was greatly helped by the adoption of an effective system of hygiene during milking.

A first attempt at area eradication, the Surrey Scheme, was put in hand and the owners of all the herds of over ten cows in Surrey were asked to co-operate. The Ministry provided the penicillin necessary for treatment and examined the milk, the veterinary surgeon carried out the treatment, and the farmer collected the samples. Of the 600 herds which participated, nearly 400 (66 per cent) were infected. The infection rate in the cows was 14 per cent. By the end of four years only 11 per cent of the herds were infected and one per cent of the cows, and it had been shown that this infection could be eradicated easily from most herds.

OTHER STREPTOCOCCAL INFECTIONS

Str. uberis and *Str. dysgalactiae* are present in most herds, and in a few they are responsible for considerable outbreaks of clinical mastitis. They do not normally spread so readily from cow to cow as does *Str. agalactiae*. Their epidemiology had not been studied until recently when some observations were made on the ecology of *Str. uberis*. As with staphylococci, the main site of this infection is the skin of the udder. The organisms were found much more frequently outside than inside the udder, and they were only found occasionally on other parts of the cow. As soon as the cows went out to grass *Str. uberis* could no longer be recovered from the skin and this correlates with the known higher incidence of *Str. uberis* mastitis in February and March.

Similar observations on *Str. dysgalactiae* are now being carried out. This organism is more commonly found in mastitis than *Str. uberis* and it has been associated with severe outbreaks where the herd has been milked with a faulty machine having a fluctuating vacuum pressure.

MASTITIS DUE TO STAPHYLOCOCCI

In an early survey of clinical mastitis carried out in 1942, 17 per cent of the cases were found to be associated with staphylococcal infection. In recent years this figure has been much higher and is at least double the earlier one. What is even more noticeable is the great increase in staphylococci found in cows' udders, either associated with sub-clinical mastitis or merely present as latent infections.

It had been suggested that this increase in the incidence of staphylococcal infection was due to the relative insensitivity of the organisms to antibiotics and so they were merely replacing streptococci which had been removed by treatment. However, it was shown at Weybridge that the main reason for the increase was the change from hand to machine milking.

It is not possible to give the exact increase in staphylococcal infection because no figures are available on the incidence before the war, but in recent surveys about 40 per cent of the cows were shown to be infected and in some herds nearly 100 per cent. Thus, staphylococcal infection is the major problem in mastitis today, and during

the past ten years much of the work on mastitis has been devoted to finding a solution to it.

A study of the epidemiology of staphylococcal mastitis was carried out at Weybridge in a herd of monozygous twins, the experimental observations lasting for six years. Strains of staphylococci were introduced into the herd by applying them to the skin of the cows or, occasionally, by infecting certain cows through the teat canal.

It was shown that while staphylococci could be found in various parts of the cow, such as the lips, perineum, vagina and various parts of the coat, the organisms were most frequently recovered from the skin of the udder and teats. While organisms could be cultured from the other sites intermittently, staphylococci were consistently found on the udder. Cows were found to carry the infection on their udders right through the dry periods, whereas heifers which were kept away from the herd were invariably free of this infection.

The study of staphylococcal infections was greatly assisted by phage typing, and a number of new phages have been isolated to assist in the identification of bovine staphylococci. It is hoped that an international set of phages will soon be available for the typing of mastitis staphylococci and Weybridge is collaborating in this work.

An interesting feature of this epidemiological study was that although it was a small herd, and reasonable precautions were taken to prevent infection from external sources, a considerable number of 'wild' strains, obviously introduced from outside, appeared in the herd during the six-year observation period.

Because of the widespread nature of staphylococcal infection and the impossibility of excluding its entry into a herd, eradication has never been considered to be practical. The best that can be done is to keep the infection within bounds, and various ways in which this might be done have been investigated.

Vaccination has been studied extensively at the Institute for Research on Animal Diseases at Compton, and there have also been a number of experiments at Weybridge. One of the problems associated with staphylococcal vaccination is that the immunity is type-specific, but one vaccine which was considered for use in Britain was stated to be polyvalent. This vaccine was used by Weybridge workers in a fairly extensive field trial in collaboration with the Veterinary Investigation Service. Equal numbers of vaccinated and control animals were kept on each farm. It was found that the vaccine did not prevent new infections, sub-clinical mastitis or clinical disease.

Staphylococcal mastitis is more difficult to treat successfully than streptococcal mastitis not only because staphylococci are more resistant to antibiotics but because they are inaccessible to treatment in the udder due to abscess formation.

The cows in the experimental twin herd at Weybridge were treated with antibiotics and although the level of infection was considerably reduced it was not eliminated. There was evidence, by phage-typing, of a breakdown in one quarter of a cow

which had apparently been successfully treated several months previously. In an earlier experiment, staphylococci were completely eradicated from a herd by treatment and by the culling of one cow which resisted treatment.

Experiments in hygiene were carried out in the twin herd to see whether it was possible to control the spread of staphylococcal infection during milking. The main source of transmission was considered to be the teat-clusters and various ways of disinfecting them, including pasteurisation, were examined. Heat in some form was the most effective treatment but was not considered very practical and so a cold-water flushing method was developed. It was possible to remove 98 per cent of the infection by running cold water through the cluster for fifteen seconds.

Since the skin of the udder and teats is such an important source of infection it was treated by using sterile individual udder cloths soaked in a solution of 1:5,000 chlorhexidine.

A control group of the twins was milked with minimal hygiene without treatment of clusters between cows, and using a communal cloth to wash the udders with hot water only. Infection was introduced into both groups by donor cows. In one experiment the donor cows were infected by applying a culture of staphylococci to the skin of the udders and in another by actually infecting the udders through the teat-canal.

Of the methods available for the control of staphylococcal mastitis, the prevention of spread of infection during milking is the one most likely to be successful. This is also true of other types of infection. A large-scale field experiment is being carried out at the moment to assess the value of these hygienic procedures in commercial herds. The results to date indicate that the control of streptococcal mastitis is possible but that staphylococcal mastitis is a much more difficult problem. Some success has been achieved, however, in a number of herds.

SUMMER MASTITIS

The main causative organism is *Corynebacterium pyogenes* but it is not usually present as the sole pathogen and in some cases, clinically indistinguishable from summer mastitis, it is absent. Several other organisms have been found in association with *C. pyogenes* in the disease, the two most frequent being *Str. dysgalactiae*, and an anaerobic organism *Micrococcus indolicus*. It is difficult to induce summer mastitis by the intramammary inoculation of *C. pyogenes* alone but it is relatively simple to do so when the other organisms mentioned are also introduced. It has long been held that flies are responsible for carrying infection to cows but this has never been conclusively proved.

Various attempts have been made to protect cattle against summer mastitis by the use of a dead *C. pyogenes* vaccine, an alum-precipitated toxoid, or both combined. After preliminary work in sheep had shown that an adjuvant toxoid had some

antigenic properties, large-scale field trials were carried out in cattle in an area of known high incidence of the disease. The results were most disappointing and it was concluded that neither vaccine nor toxoid nor both combined conferred any protection in cattle.

A number of experiments were undertaken to see whether injecting penicillin into the teats of cows as they went dry would protect them from developing summer mastitis. Because of climatic conditions and other reasons the incidence of the disease was low in the years when the experiment was done, but taking all the experiments together it was possible to show that there was a statistically significant protection against summer mastitis. The incidence of the disease varies greatly from one year to another and this makes it difficult to assess the results of experiments.

MASTITIS ASSOCIATED WITH GRAM-NEGATIVE ORGANISMS

During the past twenty years there has been a marked increase in clinical mastitis associated with coliforms and other Gram-negative organisms. Attempts have been made to reproduce these infections experimentally in the Weybridge herd, so far without success, by milking cows with infected clusters and by lowering the standard of hygiene so that the clusters were not disinfected between one milking and the next. This followed reports from field outbreaks that the trouble was associated with lowered standards of hygiene and heavy contamination of the teat clusters.

MASTITIS DUE TO OTHER INFECTIONS

In recent years there has been a considerable increase in the variety of pathogens which are found in association with clinical mastitis. For example, *C. bovis* was once thought to be a normal inhabitant of the teat-canal while *Pseudomonas aeruginosa* is a ubiquitous organism, yet both are now recovered with relative frequency from cases of mastitis. The reasons for this increased susceptibility of the udder to infections are worthy of further study.

MASTITIS AND MILKING MACHINES

A considerable amount of work has been done in the field in investigating outbreaks of mastitis which appeared to be associated with machine-milking. The recognition that the milking machine can play an important part in the causation of clinical mastitis has prompted the training of veterinary investigation officers in the testing of milking machines for faults. They have been supplied with the necessary instruments to do this in the field and can now check a machine when they are consulted about an outbreak of mastitis.

THERAPEUTIC TRIALS

In addition to the preliminary work with penicillin, any new antibiotic, or any new form of treatment which seemed as a result of preliminary tests to be of value in mastitis therapy, has been examined for its efficacy by treating a random selection of clinical cases in the field.

ANTIBIOTICS IN MILK

A report was published in 1962 of a survey on the amount of antibiotics found in the public milk supply. It revealed that 14 per cent of the milk sold in England and Wales during the year of the survey contained antibiotic, most of which was penicillin. The results of the survey, which had been anticipated by the Animal Health Division, gave a further impetus to research work on mastitis and long before the report was published work had been in progress to find alternative measures to treatment with antibiotics for the control of mastitis.

It is inevitable, however, that cows will still require to be treated, and work has recently been carried out on the effect of suspending antibiotics in quick-release bases with a view to ensuring that they are excreted in the milk for as short a time as possible, consistent with effective treatment. There seems to be no loss of bactericidal efficiency so far as streptococcal mastitis is concerned but there is doubt in the case of staphylococcal infection, and further work will have to be done before quick-release bases can be recommended generally.

With the need to detect antibiotic when it is present in the public milk supply, a number of dye markers and indicators were examined to see if they could be incorporated with antibiotics in intra-mammary formulations. The most suitable dye was food blue no. '4', which is an edible water-soluble dye, but it proved to be unsuitable for a number of reasons. Phenolphthalein was also used since it was colourless in normal milk but turned pink on the addition of alkali. Although it is quite satisfactory for penicillin it is not compatible with all antibiotics.

DISINFECTANTS

There is still a need for an efficient disinfectant to help in controlling the spread of infection during milking and to kill or prevent organisms multiplying on the udders of cows.

Various disinfectants have been examined using a routine which has been developed at Weybridge. Testing them *in vivo* is not an easy procedure and the availability of a herd of identical twins has been invaluable in carrying out this work since precise controls are essential.

CONCLUSION

From the foregoing description of the work which has been carried out over the years by the Animal Health Division on mastitis, it can be seen that it has been divided into two parts: laboratory research and field work. They are complementary. Field work is necessary to uncover the problems which are important at different periods of time. These are referred to the research worker who attempts to provide an answer from well controlled and closely observed experiments in a laboratory herd. In turn this answer has to be tried out in the field to find out if it works under commercial conditions.

Despite a great research effort, the control of mastitis in a herd has proved rather an intractable problem and the disease is still a major cause of loss to the dairy farmer: it is to be hoped that further investigations into the intangible predisposing factors may yet give a lead as to how these infections may be prevented rather than cured. Much work, however, remains to be done on mastitis and it is of interest to note that at Weybridge a senior research officer has been assigned to study fresh approaches to this important economic problem, and also that the ARC has appointed a university professor to make a similar but more comprehensive review.

BOVINE INFERTILITY

BEFORE the Second World War the Ministry was not directly concerned in the study of reproductive diseases other than contagious abortion in cattle. The importance of sterility, whether or not associated with abortion, as a cause of major loss to breeders in Great Britain did not receive proper recognition until 1934 with the publication of the Gowland Hopkins Report. This Report, which referred to surveys carried out into 2,830 herds comprising 78,905 cows, stated that one of the striking conclusions of the survey was the importance of sterility as a cause of wastage. Of 17,247 disposals recorded, 23·8 per cent were due to sterility and 3·0 per cent to abortion.

Some years later, in 1940, the Report of the Cattle Diseases Committee of the National Veterinary Medical Association estimated that sterility and abortion caused an annual loss of human food in the shape of milk and meat of over £7,500,000. (It should be noted that in these earlier reports the term 'sterility' covered all degrees of sterility, temporary or permanent, whereas the more modern definition of the term generally applies to total or permanent inability to breed, the term 'infertility' being applied to temporary loss of breeding capacity, that is, to temporary sterility.)

With the outbreak of the Second World War direct and concerted action by the

Ministry became a matter of extreme urgency because of the necessity of obtaining supplies of home-produced food. As part of the drive for increased production the Panel Scheme was introduced in June 1942 for the control of contagious abortion, mastitis, sterility and Johne's disease. As far as sterility (which in the context of the scheme basically meant temporary infertility) was concerned, the Ministry undertook to provide free laboratory facilities for diagnosis, while the practising veterinary surgeons agreed to visit the farms at regular intervals and treat any cases of infertility presented to them.

A corps of sterility advisory officers, specially trained in all aspects of infertility in cattle, in which several experienced practising veterinary surgeons assisted, was appointed by the Ministry in 1943. These officers, stationed in various parts of the country, served a particularly useful purpose in assisting and advising veterinary surgeons on the diagnosis and treatment of infertility, pregnancy diagnosis and examinations of bulls and in advising farmers on animal husbandry methods. They were subsequently incorporated into the Veterinary Investigation Service in 1946. Regular courses of instruction into the various aspects of bovine infertility have been provided at Weybridge for all recruits to the Veterinary Investigation Service and also for a number of the field staff.

The extensive use of artificial insemination with healthy bulls of known fertility rate has enabled the study of female breeding ability to be made much more accurately than hitherto. Whilst much is known about the infectious causes a great deal more needs to be known about other factors. Preliminary attempts at survey in this connection such as that carried out by Boyd and Reed in the West Country between 1955 and 1958 might well be the precursors of more laboratory statistical investigations.

In addition to laboratory diagnostic duties, notable contributions have been made by the laboratory and investigation services to the knowledge and control of various diseases and conditions affecting reproduction which may conveniently be referred to under specific headings:

TRICHOMONIASIS

This venereal disease of cattle, characterised by infertility and abortion in the earlier stages of pregnancy, is caused by infection with a protozoan parasite, *Trichomonas foetus*. The first outbreak recognised in this country was diagnosed at Weybridge in 1936, and by 1942 the disease was found to be more widespread than had been believed, especially in areas where communal bulls were widely used. In Anglesey, for example, some 600 herds, comprising about two-thirds of the cattle population in the county, were found to be infected including twenty-five of fifty-two bulls examined (thirteen premium and twelve communal bulls). The use of premium and communal bulls virtually ceased when increased facilities for artificial insemination became available and

these, together with the laboratory facilities provided by the Veterinary Investigation Service, soon led to the disease being brought under control. Little more than a decade passed before its virtual elimination from the national herd. The Weybridge work on improving methods of diagnosis helped materially in this achievement. The successful use of artificial insemination is mentioned in the discussion on that subject.

VIBRIOSIS

Following the introduction of Strain 19 *Br. Abortus* vaccine into general use in 1942 for the control of contagious abortion many complaints were received that its use was associated with infertility in the vaccinated animals. During the course of numerous investigations from Weybridge no evidence was found to blame the vaccine for infertility, but a considerable amount of circumstantial evidence accumulated to suggest that *Vibrio fetus* might be involved. The Report of the Departmental Committee into Epizootic Abortion in 1913 had stated that a vibrio-like organism had been found associated with bovine abortion in two herds, one in Wales and one in Ireland. It had also been found to be commonly involved in serious outbreaks of abortion in sheep. Furthermore, the organism described had been isolated from aborted bovine foetuses in America where it had been studied by Theobald Smith and his co-workers and it was Smith who gave it the name of *V. fetus*.

V. fetus was known to cause serious abortion storms in sheep and large-scale experimental work was begun at Weybridge in 1951 to determine the pathogenicity of the organism for cattle and its association with infertility. Marked infertility and evidence of infection was produced in heifers served by naturally infected bulls or artificially inseminated with semen from them; similar infertility was produced when heifers were artificially inseminated with semen from a young unmated bull to which had been added *V. fetus*; neither infertility nor evidence of infection was produced in heifers by feeding the organism by mouth, by conjunctival installation or by contact. Continuing experiments were concerned with the treatment of infected females and with the effect of the addition of antibiotics to naturally and artificially infected semen.

Whilst the addition of antibiotics to the semen appeared to have its limitations, later research at Weybridge and Reading indicated that treatment of infected bulls with antibiotics was highly effective and practicable. Much work was also done on improving methods of diagnosis, including the use of the vaginal mucus agglutination test, cultural examinations, and studies on the typing and antigenic structure of bovine vibrios. From the various experiments carried out striking evidence was obtained on the adverse effect of *V. fetus* on fertility. This was an important finding, particularly since it had been established that the disease was entirely venereal and it was, moreover, self-limiting in the female. Control measures were thus simplified and entailed only the use

of artificial insemination with clean semen either from commercial AI sources, from known uninfected bulls, or from treated bulls once it was shown that the treatment had been effective.

Application of the experimental findings to the field has had a far-reaching effect for while *V. fetus* infection can, and still does, exist as a serious condition in the individual herd following the introduction of infection, it has ceased to be the national problem it was a decade or more ago.

BOVINE MYCOTIC ABORTION

The association of moulds or fungi with bovine abortion has been known since 1920. In Britain interest in the condition was stimulated by the result of the ARC's *Survey of Animal Mycoses* in 1955. Seventeen species of fungi and one species of actinomycetes were thought to be involved in mycotic abortion in a review of the subject in 1959.

In 1957, workers at Weybridge and Bristol showed that routine diagnosis may be made by direct smear and cultural examination of material from aborted foetuses and foetal membranes, and their methods are now used in the examinations made at all veterinary investigation centres. Statistics have shown that mycotic agents are associated with abortions in more than 10 per cent of all examinations; indeed, apart from brucella, they are the only organisms to be isolated with any regularity. *Aspergillus fumigatus* has been the predominant type recovered.

The condition has been shown to have a definite seasonal incidence, the majority of cases occurring during the winter months. The indications are that infection takes place originally by the inhalation of spores from mouldy hay, straw and feedingstuffs but, in experimental infection, while abortion and placental lesions have been produced by intravenous inoculation, inhalation methods have been less successful. In naturally occurring cases abortion, sporadic in occurrence, generally happens during the seventh and eighth month of pregnancy. There is no evidence to suggest that infection has any effect on fertility.

VIRAL INFERTILITY AND ABORTION

Because laboratory reports from Weybridge and veterinary investigation centres had shown that from less than 30 per cent of foetuses and foetal materials could a known pathogen be isolated, interest was directed towards the possibility of viral agents being implicated. During 1953 a transmissible agent was isolated at Weybridge. After being passed through Seitz EK filters and passaged in eggs, it could produce symptoms in cattle similar to those found in naturally occurring outbreaks of infertility. The clinical picture presented was one of vaginitis, mucopurulent discharges following service, lowered conception rates and, on post-mortem examination, an oedematous endometritis. In the male there was interference with semen production.

Recent developments in tissue culture techniques have opened up new possibilities in the field of virus isolations and a number of cytopathogenic agents have been recovered from materials obtained from herds suffering from infertility and/or abortion.

NUTRITION AND FERTILITY

Suggestions that infertility may be associated with various deficiencies and imbalances in the feeding have been made for many years and have often been the source of controversy. Experiments to obtain data relating to the effects of calcium and phosphorus on fertility of cattle were set up at Weybridge in 1958, but experimental work so far has failed to produce any really convincing evidence to support the theory that the balance of these two minerals may affect bovine fertility. It is interesting also to note that, in connection with these experiments, neither the manganese levels nor the levels of copper in the liver, some of which were very low, had any influence on fertility.

JOHNE'S DISEASE

JOHNE'S DISEASE, also known in many parts of the world as paratuberculosis, is a chronic wasting disease of cattle, sheep, goats and other herbivorous animals, usually associated with persistent diarrhoea. There is some very recent evidence which suggests that pigs may become infected without showing symptoms of disease. Even today it remains an incurable disease and one which is unusually difficult to eradicate or to control. The symptoms may sometimes be temporarily arrested, and it is possible that spontaneous recovery occurs in some cases of mild infection, but as a general rule once clinical signs appear the disease ultimately proves fatal.

In this country cattle, particularly dairy cattle, are the major sufferers, although the disease does occur in its severe form in beef animals, in sheep and occasionally in goats. The economic loss caused by Johne's disease is very considerable and, with maximum productivity becoming more important each year, the investigation of possible methods of control, or even of ultimate eradication, has been given increasing attention.

The causative agent, *Mycobacterium johnei*, was not recognised until the end of the nineteenth century shortly after a very similar organism, *M. tuberculosis*, had been demonstrated as the cause of tuberculosis. No specific reference therefore was made to this disease in the Annual Reports until 1909 when Stewart Stockman included a description of the disease as it occurred in cattle. Even at that early stage he foresaw investigations by the Board to enable recognition and removal of infected animals to prevent the spread of infection. The Report refers to the disease being 'first found in

England by Sir John M'Fadyean about four years ago'. This might give the impression of recent introduction or appearance, but examination of older veterinary communications makes it clear that it was recognised in Great Britain as a specific condition, although the cause was unknown, at least one hundred years previously. It was described as a common disease of cattle associated with diarrhoea, wasting, and thickening of the walls of the large and small intestines. This accords very well with Johne's disease in its acute stage as seen today.

Stockman's Report referred to experimental infection produced by feeding diseased organs, but made no reference to age susceptibility. Subsequent workers found that when organisms are given to induce experimental infection, animals over a year old rarely become infected. Stockman also referred to the insidious nature of the infection, to the liability to clinical breakdown after calving, to the fact that animals with severe lesions may not necessarily show diarrhoea and to the apparently incurable nature of the clinical disease. All these points have since been confirmed and, despite subsequent extensive investigations, Johne's disease even today poses peculiar difficulties to the research worker.

The Report also mentioned the finding of bowel lesions like those of Johne's disease, and large numbers of acid-fast organisms, in a sheep considered to be affected with scrapie. This observation was considered more as a possible explanation of the cause of scrapie than the first recognition of Johne's disease in sheep, but in his Report for 1911 Stockman made the position clear by stating that, although the natural disease had hitherto been considered peculiar to cattle, there was no doubt sheep may become seriously affected and must be considered a factor in the epidemiology of the disease. An outbreak is described in which twelve of sixty-five purchased sheep died after a period of severe scouring and the development of emaciation. The intestines, particularly the small intestine, were not corrugated but thickened and covered by creamy mucus in which enormous numbers of acid-fast bacilli were demonstrable; bacilli were also found in lymph nodes. Emphasis was placed on the very large numbers of bacilli in the tissues, and it was mentioned that several other farmers purchasing sheep from the same source had suffered similar losses.

After Stockman's original contributions very few references to Johne's disease were made officially until 1934. This may have been due to the fact that several other conditions simulated it or that owners recognised its progressive and fatal nature and disposed of early cases for slaughter. By means of the Tuberculosis Order of 1925 compensation was paid for cattle which were slaughtered because they were affected with certain specified forms of tuberculosis, including emaciation. In the early period of the Order it now seems certain that the condition of many of the emaciated cattle which were commonly known as 'screws', and which were slaughtered, was really due to the debilitating effect of Johne's disease rather than tuberculosis. In fact, in the Annual

Report for 1926 it was urged that the tuberculin test should be used sparingly except in possible cases of Johne's disease, where its use might be desirable to prevent the slaughter of 'screw' cattle which did not come within the scope of the Order.

There is, however, no evidence to suggest that Johne's disease receded as a disease problem during this period; it was possibly an era when more conspicuous problems offered greater scope for investigation. In 1934 the Chief Veterinary Officer's Report referred to the findings of the Gowland Hopkins Committee which assessed the incidence as varying greatly throughout the country, and found that in some districts it was apparently increasing and causing considerable anxiety. Once again reference was made to the need for a reliable diagnostic agent for identifying pre-clinical infection, and vigorous pursuit of research into Johne's disease was recommended to the Agricultural Research Council.

Johne's disease was included in the Panel Scheme in 1942. It never played a very prominent part in the scheme because the recommendations were solely concerned with hygienic precautions desirable to restrict the spread and reduce the incidence of infection; virtually it was no more than an attempt to bring into operation principles that had been recognised for many years. Nevertheless, the scheme was essentially one which aimed at the application of control measures on a herd basis and, as such, was of value in drawing attention to Johne's disease.

Until 1952 government research work on Johne's disease had been mainly carried out by the Agricultural Research Council, but about this time the Animal Health Division began to play a more active part. The three chief lines of investigation that have been pursued are attempts to survey the incidence of the disease, to improve methods of diagnosis in the living animal, and to find and inaugurate practical methods to control the incidence or to eradicate the disease.

The insidious nature of Johne's disease, the sporadic occurrence of clinical breakdown, and the fact that owners are reluctant to admit its existence, have made it equally difficult to assess its incidence or to devise methods of control. There is no doubt that Johne's disease has been one of the more serious economic problems in cattle in this country for a long time, and the Ministry decided in 1946 that some surveys of the incidence of the disease were indicated. A survey, commenced in 1948, was carried out at Weybridge based on the examination of faecal samples from clinically suspicious cases. The specimens were provided by practitioners from different parts of Great Britain; a positive diagnosis was made if clumps of the organism were present in the sample, and a diagnosis of 'suspicious' in cases where only a few single organisms were seen. Of some 3,800 samples from thirty counties 25 per cent were positive and 19 per cent were suspicious. Positive cases showed a widespread distribution with particular concentration in some areas; the significance of this was questionable, however, because the number of samples received depended on the enthusiasm of the practitioners

and on cattle concentrations. Some attempt was also made to assess breed susceptibility, but the evidence obtained did not suggest that there were significant differences.

Following several local surveys a major investigation into Disease, Wastage and Husbandry in the British Dairy Herd was carried out in 1957-58. This survey, which was the subject of a special Report issued in 1960, indicated that Johne's disease and acute mastitis were the two diseases causing the greatest total loss through depreciation in market value. Although mastitis is much more common it does not necessarily lower the carcase value; the productive life of the cow affected by Johne's disease is nearly halved and its commercial value is practically nil. It was also found that there appeared to be a marked difference in breed incidence and in the prevalence of the disease in different regions of Great Britain. Of the 31,000 cattle surveyed about 0.5 per cent developed clinical disease but on some farms this figure was as high as 15 per cent. It is important to remember that these surveys have been based on the incidence of clinical disease and not on the incidence of infection; there is an increasing amount of evidence to show that infection does not necessarily cause clinical breakdown. There has been no extensive survey of the amount of infection and its economic effect on productivity. A survey made by examining the tissues of some 350 abattoir animals showed that 15 per cent were infected (14 per cent cows, and 17 per cent bullocks and bulls). In another area infection was found in 17 per cent of 300 local abattoir cattle in 1954 and infection in 21 per cent of 214 abattoir sheep in 1955.

In the diagnosis of Johne's disease the advanced clinical stages offer little difficulty because the symptoms are very characteristic, but early recognition of infection and confirmation of the disease at the first appearance of suspicious symptoms have proved obstinate problems. To control spread of infection early diagnosis is essential for the organism may be excreted in the faeces some time before symptoms appear.

Allergic tests were probably the first to be used for detection of hidden infection in the living animal. Avian tuberculin was the diagnostic agent employed. Subsequently johnin was prepared in the same manner but this proved no more specific, and, indeed, avian tuberculin today is generally regarded as of equal or even better practical value. Experience has shown that in Johne's disease the allergic reaction is not of comparable value to that of tuberculin in tuberculosis; the allergic sensitivity of the naturally infected animal appears to be very low and irregular. Apart from preparing johnins, mainly for testing certain animals for export, the Ministry has not made use of the allergic test for diagnostic investigations of Johne's disease other than considering the avian reactions obtained in the routine comparative tuberculin tests and comparing them with post-mortem findings in a few experimental herds. The limitations of the allergic test have been confirmed in some laboratory work on experimental infection, and by the tuberculin test records of some Johne's affected herds under observation.

It would appear that experimentally infected animals develop reactions to avian tuberculin and johnin which tend to fade as the disease progresses and it is unusual for reactions to occur after the appearance of clinical symptoms. In comparison to the tuberculin reactions in a tuberculous animal the increase in skin thickness is not large, a 10-mm. rise being a big reaction. In natural infection the picture revealed by the annual comparative tuberculin test in affected herds seems different; in one particular herd in which material from all animals slaughtered was examined only 66 per cent of those found infected had ever given a reaction to avian tuberculin according to their test history. The diagnostic value of the allergic test in individual animals would appear at the moment to be in doubt especially as not all reactions to avian tuberculin or johnin are due to infection with *M. johnei*. Work is in progress at Weybridge in which attempts are being made to increase the reactions and the specificity of johnin by strain selection and further fractionation of the PPD product.

Disappointment over allergic testing led to further interest in serological tests at Weybridge. Some initial work in 1949 on the haemagglutination test was followed by a more extensive examination of the possibilities of complement-fixation. Preliminary trials suggested there was a practical use for the complement-fixation test in the diagnosis of Johne's disease. Unlike the allergic test the more advanced the infection the better are the results, and complement-fixation has proved a useful and sufficiently reliable confirmatory test to enable a firm diagnosis to be made in the earliest stage of clinical disease. A diagnostic service has been established at Weybridge where blood samples from suspected cases of Johne's disease are tested; several thousand have been examined annually for the past ten years.

Like the allergic test, however, the complement-fixation test has limitations; although a positive reaction may be obtained in an infected animal some time before the appearance of clinical symptoms, no reaction is obtained in the early stages of infection; some animals do not react until shortly before, and a few until after, the appearance of clinical signs, whereas others react consistently for months before any other evidence of infection is obtained. Publication of the Ministry's findings resulted in repetitive work in different parts of the world which confirmed the value of the test in the diagnosis of early clinical or late pre-clinical stages of infection.

The overall specificity of tests which do not involve the isolation of the causative organism is difficult to establish in a disease of this nature, in which slaughter and thorough post-mortem examination are the only means of proving the presence of infection and where even these methods are fallible. There is a considerable degree of cross reaction between some of the mycobacteria, and some tuberculous animals react to Johne's complement-fixation test. Although this test, applied to suspected animals, or used in herds where the presence of the disease is recognised, has proved to have a considerable degree of accuracy, its use on healthy animals in herds where the presence of

the disease is not recognised has been questioned. The position is complicated by the fact that investigation has shown that the infection may exist in herds where there is no reason to suspect its presence on clinical grounds; it may only come to light when animals are sold to another owner.

There is clearly need for improvement in diagnostic methods of *in vivo* testing and the possibilities of other diagnostic tests and modifications of those now employed are being examined at Weybridge.

In 1942 some experimental work in connection with control of the disease was begun at Weybridge to investigate the safety and the efficacy of the method of vaccination against Johne's disease recommended in France by Vallée and Rinjard. These experiments confirmed that living *M. johnei* could be inoculated into cattle by the subcutaneous route without causing infection, and that, as the French workers claimed, if the organisms were inoculated in an oily excipient they were confined in a local lesion, the persistence of which gave rise to a degree of immunity against natural infection. It was also found that vaccination sensitised animals to mammalian tuberculin.

Experiments of this nature with a disease that is so slow to develop take a long time to complete, but by 1946 it was decided that the preliminary test results justified a field trial of the vaccine in heavily infected herds where other attempts at control had failed. This first field vaccination experiment is now known as Field Trial I. In France vaccination had been practised on animals of all ages in the selected infected herds because it was considered that animals already infected at the time of vaccination would not develop a nodule at the site of inoculation, and that this phenomenon could be used as a means of identifying infected animals. It is not considered desirable to vaccinate adult animals in this country; the use of living *M. johnei* sensitises the animal to tuberculin and, although the reaction to avian tuberculin is usually more marked than to mammalian, and permits differentiation from a reaction due to tuberculosis, it was not considered wise to complicate tuberculosis diagnosis more than absolutely necessary. The tuberculin reactions resulting from calfhood vaccination tend to fade with age. In addition to this, for the purposes of a trial, it was desirable to expose vaccinates to a certain amount of infection. Subsequent experience has confirmed the desirability of confining vaccination to calves.

By 1948 Field Trial I embraced 97 infected herds, and 2,500 calves had been vaccinated without any untoward effect apart from trouble in a few herds over the development of unusually large vaccination nodules, generally after re-vaccination.

Analysis of the effect of vaccination on the incidence of Johne's disease in the herds included in Field Trial I was made annually. As the proportion of vaccinated stock increased the incidence of Johne's disease decreased; by 1957 the average herd incidence had dropped to 0.28 per cent compared to 3.6 per cent at the time the trial started. On strict experimental grounds the trial was open to the criticism that there were no

control non-vaccinated calves being reared on the farms at the same time as the vaccinates under the same conditions of husbandry and exposure to infection. It was therefore decided to run a second trial in which only half the heifer calves were to be vaccinated, and in which it was hoped to include 1,000 herds. This was begun in 1956 and was known as Field Trial II. A complementary laboratory experiment was started in 1958 in which twenty-nine vaccinated, and the same number of non-vaccinated, heifer calves were housed with heavily infected donor calves for six months before being put out to grass; a third group of twenty-nine which was to be re-vaccinated was included.

The number of herds applying for entry in Field Trial II was disappointing. At the end of 1963 only 370 herds were under experiment, at which time fifty-three of the vaccinated cattle (mostly Channel Island breeds) and eighty-six unvaccinated controls had developed Johne's disease; thirty of the vaccinates which had broken down had been re-vaccinated at eighteen month intervals.

Taken in conjunction with the findings in the laboratory experiment, it is possible that re-vaccination in certain circumstances may be contra-indicated or at least offer no advantage. In the laboratory experiment eighteen of the control animals, nine of the once-vaccinated, and fourteen of the repeatedly vaccinated had developed clinical disease by the end of five years. A much greater degree of protection than these final figures suggest was evident up to four and a half years after exposure to infection, but only in the once-vaccinated group. The degree of exposure in this experiment was exceptionally heavy and was a severe test of the protective value of vaccination. This experiment also showed that Channel Island cattle are much more prone than some other breeds to develop clinical Johne's disease.

Statistical analyses of the experimental findings, and those at present available for Field Trial II, confirmed that vaccination has a positive value for the prevention of clinical Johne's disease; it would appear to be least effective, although still beneficial, in Channel Island breeds. A decision was made in 1964 that, despite the recognised complications to the tuberculin test that might result from its use, vaccine would be made available for herds with a Johne's disease problem, providing that the tuberculin-testing history of the herd over the previous two years had been satisfactory. The importance of ancillary hygiene control measures to the success of a vaccination programme was emphasised. The field trials were discontinued on 30 April 1964.

A number of other aspects of Johne's disease have been examined by the Ministry over the past twenty years. Research at Weybridge provided the first confirmation of Alexijeff-Goloff's disputed assertion that infection of the foetus could occur *in utero*. This was of fundamental significance to the control of the disease. Several investigations have been made on the effect of vaccination on the interpretation of the tuberculin test, on the relationship of age and susceptibility, on familial susceptibility, on the

possible excretion of *M. johnei* in the milk, on cultural methods and the improvement of culture media. Vaccines have been examined to assess the possibilities of one which produces no nodule and the minimum sensitivity to tuberculin, and another which is given by the mouth. Johne's disease has been observed and studied in identical twins and the effect of the infection on the milk yield recorded. Field experiments were carried out in a number of infected herds to find whether the infection could be eradicated by regular repeated complement-fixation tests combined with the elimination of all reacting animals; this procedure was found to prevent the occurrence of clinical disease, but, although initial results were promising, testing over a period of years showed that it did not succeed in eliminating all infection and that oncoming stock were still liable to develop reactions to the test.

A great deal of research work is being done at other centres, notably at the Institute for Research on Animal Diseases, Compton, Berkshire, and at the Animal Diseases Research Association, Moredun Institute, Edinburgh. This work is co-ordinated through the Agricultural Research Council and, indeed, conferences on Johne's disease have been held periodically and have endorsed the policy now adopted for its control.

WARBLE FLY

THE WARBLE FLY is found all over Europe, Asia, Africa, Canada and the USA but Australia, New Zealand and Argentina do not appear to suffer from its depredations. Warble flies, found throughout Great Britain, are more prevalent in the west than in the east, the two common species being *Hypoderma bovis* and *H. lineatum*, whilst a third, confined to red deer, *H. diana*, is found in Scotland. The adult fly lays eggs from May to August, usually on the legs of the cattle. The maggot hatches out in a few days, penetrates the skin and, after migrating through the body of the host until the following winter and spring, appears under the skin of the back. The fully developed maggot emerges from the skin, drops off, pupates in the ground, and six months later the fly is liberated.

Between 1920 and 1926 a departmental committee of the Ministry of Agriculture investigated the warble fly problem, and in March 1927 the leather and allied trades urged the Minister to continue the work of this committee and to consider legislative action. In June 1929 a committee was formed by the Leather Sellers' Company, representing the leading agricultural bodies, the leather and other trade associations concerned and county authorities. It embarked upon an immediate campaign in order to secure the voluntary treatment of cattle on the widest possible scale during 1930.

In July 1935 the Minister asked the Governments of Northern Ireland and the Irish

Free State if they would be prepared to introduce a compulsory dressing Order for infested cattle if one was made generally applicable to Great Britain. Agreement in principle was subsequently reached in December 1935. In the following month the Warble Fly (Dressing of Cattle) Order of 1936 was issued. Similar Orders were issued at the same time by the Ministries of Northern Ireland and the Irish Free State.

The Order required treatment by one of two alternative methods. The first involved dressing visibly infested cattle with a specified preparation of powdered derris root and soap at monthly intervals from March to June or until the maggots ceased to appear. The second method required the removal and effective destruction of all live maggots from the backs of infested cattle, by squeezing out or by other mechanical means, at intervals not exceeding ten days during the months of March to June or until the maggots ceased to appear. This method was prohibited in 1940 by an Amendment Order, leaving the first alternative as the sole method of official treatment.

At the time the Order was published it was recognised that difficulties might arise in its application to cattle grazing on common ground or unenclosed range or hill lands where cattle were turned out every summer for some months. Local authorities were given powers, therefore, to grant exemptions for cattle on such grazings. The Order continued in force until 1942 when it was suspended, mainly because of the shortage of derris root but partly because of labour difficulties.

On 1 March 1948 a new Order was made revoking the previous ones and, with slight alterations, re-enacting their provisions with rather more precision on the intervals of dressing, and requiring owners who bought animals which were visibly infested to treat them within seven days of purchase.

On 30 December 1960 an Amendment Order made it obligatory to treat cattle in which warbles could only be detected by touch as well as those visibly infested.

During the years 1953-56 an experiment was conducted by the Ministry in the Isle of Wight to determine the effectiveness of regular and adequate dressing of cattle, using derris. The proportion of cattle infested was reduced from 40 per cent in 1953 to 2 per cent in 1956. Whereas in 1953 infestation with thirty to forty warbles was fairly common, in 1956 it was rare to find an animal, other than one moved from the mainland, with more than one or two warbles. It was, of course, extremely difficult to provide for these cattle because they might arrive at a time of the year when warbles were not evident, although they were possibly infested.

The Warble Fly Order was finally revoked in July 1964 for reasons which are explained later.

During the six to nine months which the larvae spend in the host they cause injury by releasing toxic products while migrating, but the most serious and obvious damage is to the hide and is caused by the emerging larvae or warbles. Either there are small holes caused by the warbles or round thin areas of scar tissue, the so-called 'blind

warbles' which are, in reality, healed warble holes. The adult fly causes considerable loss of milk and flesh by persistently disturbing cattle, the so-called 'gadding'. All in all the depredations of this parasite cause severe economic loss. During the Second World War, when the Ministry of Food was the sole purchaser of cattle for slaughter, it estimated an annual loss of £150,000 on the sale of warbled hides; in Britain the total annual loss, including the diminution of milk yield, damage to flesh and depreciation in leather, has been estimated at between £1,400,000 and £2,800,000. Taken even at the lower figure this represents a serious wastage to the national economy.

Attempts to deter the adult fly by the application of repellents and insecticides to the animals have not been effective, and attention has therefore been directed towards the destruction of the migrating larvae. Before the introduction of the systemic insecticides the parasite could only be dealt with at the stage in its life-cycle when the warble has punctured the skin. The dressing period was thus restricted to the spring and early summer and, as the maggots do not all mature at the same time, repeated dressings were necessary. Because stock might be at grass at some distance from the home premises during part of the dressing season the Order required that the dressings should be done at intervals of not more than thirty-two days so long as the warbles continued to appear. Thus, compliance might involve much time and labour.

The search for a dressing which would be effective, easy to apply, harmless to the operator and to the treated cattle, destructive to the larvae and economic in use had led, via a mixture of tobacco-powder and lime (which was efficient but troublesome to prepare), to a series of experiments in Scotland in 1923 which eventually demonstrated that derris fulfilled the requirements. In 1930 extensive tests in Scotland indicated that a practicable, successful and cheap measure for the destruction of the larvae was now available although, of course, care in application by removing scabs to allow penetration of the insecticide was essential and added to the labour involved. Preparations of powdered derris root and soap remained the official method of treatment until revocation of the Order.

Theoretically, warble fly could be eliminated by the use of effective dressings to the warble in the skin of the animals' back. However, there are many practical difficulties including the fact that the major loss does not directly fall on the owners of the living animals and so there is little incentive to dress; dressing must be carefully done to be effective, especially with long-haired cattle, and all warbles must be dressed; animals are at grass during the dressing season and young stock in particular may be at summer grazing far away from the steading. The Order could not be enforced because failure to treat could not readily be proved and, even when it was fairly clear that an offence had been committed, the risk of failure to convict prevented the local authority from taking legal action.

From 1958 to 1962 experiments, in which the Veterinary Investigation Service and

Weybridge were concerned, were conducted using organo-phosphorus compounds as systemic insecticides designed to destroy the larval stage of the warble fly during its sojourn in the animal body. The trials showed that such compounds do in fact kill the migrating larvae. They may be given by mouth or, because they are absorbed through the skin, by application to the back of the animals as spray, wash or emulsified concentrate.

Advantages of the systemic insecticides are that only one application per year is needed, thus saving time and labour; they can be applied at a time convenient to the farmer; they destroy the parasite before the hide is damaged, and they are non-persistent chemicals which do not present a hazard to animals or man provided the recommendations for their use are properly followed. A minor disadvantage is that all animals at risk must be treated because there is no method of detecting infestation before the emergence of the warbles.

The introduction of the systemic insecticides, whilst providing a new, efficient and simplified method of treatment and control, would not have made the Order any more enforceable and it was therefore revoked at the conclusion of the 1964 dressing season.

The Warble Fly Order having been revoked, the way is now clear for the Animal Health Division to undertake vigorous advisory and publicity measures to encourage stock-owners to use systemic dressings and to stress the benefits arising from preventive treatment. A Warble Fly Campaign Committee, representative of the various interests concerned, has been set up under the chairmanship of the National Farmers' Union with the aim of co-ordinating advice on the advantages of warble fly eradication as a matter of good husbandry and advocating autumn treatment with systemic insecticides as a preventive measure.

ADVISORY SERVICE TO HILL SHEEP FARMERS

DURING the 1930's, hill lambs were selling for as little as 5s. each, wool was down to 6d. per pound and hill sheep flocks were suffering crippling losses from disease. To the shepherd, struggling for economic survival, veterinary attention to his sheep appeared, paradoxically, to be an impossible extravagance. Most hill farmers appeared to be quite resigned to the deaths which occurred with such appalling regularity in their flocks, not realising that veterinary knowledge, which was available, could have lowered the mortality rate appreciably. This state of affairs was undesirable in peace and intolerable in war. By 1939 the population of hill sheep had dropped by some 7 millions and there seemed little chance of any marked increase while mortality stayed at the pre-war rates.

In 1942 the Ministry accepted the need to establish closer contact with hill sheep farmers so that their problems could be known and advice given on modern methods of prevention and treatment of sheep diseases. The appreciation of the importance of this project may be judged by the fact that fifty-six days after the decision had been taken the service was operating; no mean achievement in those difficult days.

Fourteen veterinary officers were specially chosen. They were required to have pleasant personalities and a wide knowledge of animal diseases and husbandry, and most of them had special knowledge of sheep as a result either of their early upbringing or of the work that they had been doing. After brief courses of training in laboratories which dealt with sheep diseases they were stationed at suitable places to provide a service to hill farmers in Northumberland, Cumberland, Westmorland, Durham, Yorkshire, Derbyshire, Devon, Cornwall, and north and south Wales.

Because of staff shortage the work of the Ministry's veterinary officers had previously been confined mainly to their statutory duties in the dairying areas, and hill farmers received little or no attention. Now, the chosen officers were required to devote the whole of their time to acquiring a thorough knowledge of conditions in their own areas so that they would be in a position to give advice on sheep management, and prevention and control of sheep diseases. Although they were still answerable to their senior officers, they were given what amounted to a free hand as far as methods were concerned. This is, admittedly, sound policy when good men have been chosen but the fact that nobody knew how to go about the job may have influenced this decision. The only detailed directive was that close collaboration should be sought with the County War Agricultural Executive Committee, the local veterinary surgeons and veterinary investigation officers.

Much heart-searching and planning must have occurred in the weeks before these officers began their new duties. British hill farmers were known to be ruggedly independent. A tactless approach to the first few of these isolated hill farms could have caused the scheme to founder as it left the slipway and it might have taken years to repair such a blunder. Naturally, each officer wished to be particularly successful and the fact that the scheme worked so well is probably a tribute to the care with which each was selected.

Each officer appears to have chosen approximately the same method of approach to the task in the initial stages. In consultation with the County War Agricultural Executive Committee, he selected a number of hill farmers who were known to be approachable and concentrated on establishing good relations with them. By judicious manipulation of visits this circle of acquaintance was gradually widened. Disease problems were so numerous that it was easy to offer advice on the prevention or cure of some of them, and the successful adoption of this advice cemented firm friendships. Often the officer had to obtain the necessary serum, vaccine or medicine and demonstrate the

technique of injection, and this, as well as helping the farmer, brought the officer even closer to the problems of sheep handling and general husbandry.

As winter approached, the hill sheep officers (as they were now called) had developed a good number of close contacts with sheep farmers and programmes of lectures were arranged. These were deliberately made as informal as possible, the most successful meetings being those where a small group collected in the local public house and had a discussion rather than a formal lecture. Although visits to farms were necessarily less numerous during the winter it is probable that acceptance of the hill sheep officers was speeded as a result of the talks. By the time lambing began the officers were on terms of friendship with most of the hill farmers in their areas.

The close contact established now began to pay dividends because the picture revealed at lambing time and up to weaning was almost unbelievably distressing. Losses of 25 per cent of the lamb crop were common and even this figure was exceeded in some flocks. Since few flocks produced 100 lambs from 100 ewes it quickly became apparent that no flock could hope for a weaning percentage of more than 75 per cent and very few could achieve even this. All the ewe lambs were needed for replacements and no selection of them was possible. Indeed it was difficult even to maintain the original numbers of the flock unless replacements were bought. Some of the losses were unavoidable because the ewes had been so badly fed during pregnancy, but many were caused by preventable conditions such as lamb dysentery, pulpy kidney, swayback and louping-ill. As the season advanced other unnecessary diseases, particularly braxy and fluke infestation, added to the losses. Advice given during 1943 was responsible in subsequent years for a vast increase in the hill flocks.

After 1943 the task became more difficult. Hill farmers had been given advice which, if followed, considerably lowered the incidence of disease, but left a residue of conditions with which the officers were not familiar. In many cases these diseases caused unthriftiness rather than death but this was nearly as important as the more fatal type in an environment where even healthy sheep had to work hard to get a maintenance ration. Although they were not equipped to do research, most of the officers attempted to solve at least one major problem. Field trials were carried out to investigate means of controlling swayback, blackleg, trace element (particularly cobalt) deficiency, heavy worm infestation and twin lamb disease. At this stage fears were expressed that research would prove to be so attractive that advisory work would tend to be dropped, but this situation never developed. The farmers had become so dependent on the officers that visits to look for advisory work were no longer needed—responding to calls from the farmers was more than a full-time job.

The field trials carried out in the scheme were not designed to give the clear-cut results of the more sophisticated experiments undertaken by research workers but they did at least act as pointers. Results of these trials, together with the information col-

lected about disease in hill flocks, have been of great value to veterinary research workers and the reduction in losses in hill sheep must have had a profound effect on the stability of the industry. As the scheme progressed, practising veterinary surgeons were increasingly brought into the picture and the hill farmer now looks on the veterinary profession as an indispensable adjunct to farming.

Protective Measures

IMPORTATION

GREAT BRITAIN is favoured in its control against the introduction of animal disease from abroad by the simple fact that it shares no land boundaries with other countries.

Undoubtedly, centuries ago, epidemic diseases of stock were brought to this country by traders, invaders, colonisers and itinerants from Europe, but it was not until after the middle of the eighteenth century that any action appears to have been taken to control the importation of livestock. In 1769 the landing of cattle hides from Baltic countries was prohibited and a few years later regulations were made to control the landing of foreign animals. In 1803 Sir Joseph Banks, writing in Young's *Annual of Agriculture*, warned all importers of Spanish sheep of the danger of introducing sheep-pox. The warning was unheeded and pox and other contagious animal diseases were introduced. At last, in 1848, an Act was passed to enable the inspection of imported stock at ports and the destruction of those affected with disease.

In the earlier years of the nineteenth century importations were irregular and limited, but an impetus was given to the trade by the removal in 1846 of an existing import duty. Records show that in 1842 imports of livestock amounted to 4,264 cattle, 644 sheep and 410 pigs, but in 1865 the numbers had risen to 283,271, 914,170 and 132,909. A consignment of cattle from the Baltic in 1865 re-introduced cattle plague to Great Britain after nearly one hundred years of freedom, with calamitous results to the national herd. Before this epidemic was finally stamped out, more than two years later, it was estimated that nearly half a million cattle had died from a population of about 6 million. Disease spread to fifty counties; the worst affected was Cheshire where about 60 per cent of the cattle died.

This outbreak of cattle plague demonstrated the need for a strong central authority to control animal disease and livestock imports, and proved that slaughter, far from being a policy of despair, was an invaluable method of control.

In 1869 regulations were introduced which gave extensive powers to the Privy Council to define the portal areas in which animals for slaughter might land, to limit the number of such ports, and to subject imported animals to detention or slaughter or, in certain circumstances, prohibit them from landing. Those animals showing symptoms

of contagious disease could be detained until it was decided whether slaughter and disposal should be carried out. This appears to be the first attempt in this country at quarantine but as the system of inspection was very lax its effectiveness in reducing the introduction of disease was limited. In 1871 the responsibility for the inspection at landing places and the appointment of inspectors was transferred from the Customs to the Privy Council, and thereafter only veterinary surgeons were appointed to carry out these duties. At this time stock affected with foot-and-mouth disease, sheep scab, sheep pox or pleuro-pneumonia were being landed at ports in Great Britain from Europe and from Ireland. Irish cattle had not previously been subjected to examination but in 1874 inspectors for this purpose were appointed and the number of permitted landing places was considerably reduced with a view to concentrating the trade.

One very desirable result of this control at the port of entry was that it became possible to identify the country from which disease came. This knowledge was obviously of fundamental importance and dictated future policy. In 1873, for instance, when foot-and-mouth disease was re-introduced by Irish cattle, a select committee recommended that regulations controlling contagious disease in Great Britain and in Ireland should be identical, that they should be rigorously enforced and that the Irish Government should take steps to inspect all the stock exported to Great Britain so as to prevent shipment of any diseased or infected animals.

In 1878, after cattle plague had been re-introduced almost simultaneously at two ports during the previous year, a further select committee led to the passing of a more comprehensive measure to control the importation of animals. Free importation was permitted from safe countries, such as Norway and Sweden, while there was a complete prohibition from others, such as Russia, which were thought to be especially dangerous. The principle of conditional slaughter was affirmed for stock from Spain, Portugal, the Netherlands and other specified countries. How effective these measures were, in general, is now difficult to say, but it is a fact that cattle plague never again appeared in this country.

The powers in the 1878 Act were insufficient to protect against the introduction of foot-and-mouth disease but, encouraged by the results of the measures already in force to prevent introduction of disease from Ireland, greater control was vested in the Veterinary Department of the Privy Council by the Act of 1884. A prohibition was imposed on the landing of animals from any country where, in the Department's judgment, the disease situation was unsatisfactory and where there were insufficient safeguards against the introduction of foot-and-mouth disease; this resulted in a series of Orders restricting the entry of stock from countries such as France, Italy and America.

There were still loopholes after the consolidation Act of 1894 because reliable information regarding disease control was not always forthcoming from exporting countries. Therefore a further Act of 1896 led firstly to the Foreign Animals Order of

the same year which prohibited the landing of animals from countries known to be dangerous, and regulated and controlled the landing of animals brought for slaughter from all other countries; and secondly to the Foreign Animals (Quarantine) Order of 1896 which determined the general conditions under which animals might be brought to this country for exhibition. Two further Orders prescribed less rigorous conditions for animals from the Channel Islands and the Isle of Man in view of their good health records.

The Diseases of Animals Act of 1894 and subsequent legislation provided authority for most of the present Orders dealing with the importation of ruminants and swine. The conditions range from veterinary inspection of animals before they land, to their detention for a sufficient period in quarantine if necessary. There are also regulations for exportation, including welfare and quarantine. Most of this legislation was consolidated into the current Diseases of Animals Act 1950 to which only two minor amendments have been made from the point of view of disease control: the Agriculture (Miscellaneous Provisions) Act of 1954 extended import and export regulations to cover air transit, and the Agriculture (Miscellaneous Provisions) Act of 1963 enabled Ministers to prescribe fees for the provision of health certificates and licences provided by them in connection with imports and exports.

The foregoing brief history leading to present legislation shows that attention was at first paid, after bitter experience, almost exclusively to the risks attaching to the importation of live animals. The errors of short-sighted policies were adequately demonstrated by repeated epidemics of cattle plague, foot-and-mouth disease and pleuro-pneumonia which followed such introductions during the nineteenth century. In 1863 Gamgee, convinced that the importation of cattle plague was imminent, warned the nation of the potential results of its introduction. His predictions were ignored, and even during the ensuing epidemic of 1865-67 his recommendations were initially decried and obstructed by selfish interests and the free trade shibboleth of the day. It must be appreciated, however, that a century ago the full significance of disease transmission was not understood and confusion abounded even to the extent that some authorities produced what they considered to be conclusive proof of the spontaneous generation of bovine pleuro-pneumonia. The long incubation period was not recognised and this, understandably, led to false conclusions. Gamgee considered that the importation of carcasses rather than live cattle would probably remove the risk of introducing animal disease: he had, of course, mainly cattle plague in mind. Helpful though this was, carcase meat, offal and bones still carried considerable risks, but it was not until after the First World War that comprehensive measures were taken to control the introduction of meat, animal products or materials so as to reduce the disease risk.

Infection may be introduced in a great variety of ways and the control of all import-

ations has become a first principle in our disease control system. Obviously the likeliest method of conveyance of infection is by livestock themselves but fortunately, by the use of quarantine under veterinary control and by making the maximum use of laboratory tests, this loophole can now usually be closed. When early legislation laid down that only parts of specific ports would be used, in order to improve inspection and control, it did not provide for slaughter in the landing place: for many years animals continued to be landed, inspected and driven away, without further control, to any part of the country for slaughter. In 1879, the control of foreign animals was improved and designated Foreign Animal Wharves were established for the isolation and slaughter of animals within ten days of arrival. In that year the first of these lairages was established at Birkenhead. The foreign trade there reached a peak in 1897 and gradually declined so that by 1912 the bulk of imports were from Ireland.

Because of the satisfactory disease position, cattle from Ireland and Canada have always been dealt with less rigorously than animals from other countries in that they might simply be landed at such ports as Glasgow or Liverpool and moved away with no further conditions attached to their movements. In the hands of dealers they might be driven long distances from market to market until finally sold. In 1912, following the introduction of foot-and-mouth disease from Ireland, more stringent regulations and firmer procedures were laid down, specifying adequate lairage, detention, veterinary inspection and licensing of movement from the port. Ten years later the Animals (Landing from Ireland) Order of 1922 was introduced. This required that store cattle from Ireland be detained at their place of detention for twenty-eight days (reduced later in the same year to fourteen days). However, in the Irish Animals Order of 1922, this detention period was changed to thirteen days, and representations by stock salesmen resulted in yet a further reduction to six days later in the same year. This requirement was not necessary because of disease risks from Ireland; its practical value lay in breaking the chain of contact by Irish cattle passing through numerous successive markets, which had occurred earlier that year. Similar conditions were applied to cattle from Canada and, though the trade in store cattle ceased in 1938, the same regulations still apply. There is less need to discriminate nowadays between Irish and home-bred stores for there is nearly as much movement of the latter but, of course, Irish cattle are usually in sizable consignments and belong to dealers.

Livestock from Great Britain was at one time in great demand but the traffic is now by no means one way and enterprising owners or groups in Great Britain may seek imports for improvement of the native stock. Since 1894 occasional importations of high-quality stock from normally prohibited countries have been permitted when it has been established that the potential benefit to a breed in general is warranted; but no import is ever allowed when there is an appreciable risk of introducing disease.

Each importation is governed by a special Order and the final movement into or

within this country is covered by licence. In order that all disease precautions may be taken, and before deciding in the first instance to accept stock, a veterinary mission may visit the exporting country to examine the animal health position and controls. From this, first-hand knowledge is obtained on which are based the veterinary conditions under which the importation may be allowed; these usually include quarantine both before and after shipment. The conditions laid down in the Orders may vary according to the disease position in the country of origin, and before the importation is allowed all relative information is obtained so that appropriate laboratory tests and other veterinary conditions may be stipulated in respect of any disease which presents a danger. If, for example, foot-and-mouth disease vaccination, prohibited in Great Britain because it may mask overt disease, is practised in the exporting country then only unvaccinated stock can be considered as acceptable. Usually, freedom of the country, or parts of it, from diseases notifiable here is required and a negative result to tests upon the individual animals for other stipulated diseases is demanded. Precautions are taken to ensure that no other stock is carried on the importing vessel, and forage and feedingstuffs are often supplied from this country for the period of quarantine and transport. Restrictions on ports of call and, if necessary, upon the route taken, may be laid down: this is to guard against the risk of animals contracting disease on the way and so nullifying the tests and the quarantine already successfully completed. The transit of ruminants via the Suez Canal is consequently avoided because of the dangers of blue tongue, a disease transmitted by flying insects and prevalent in the African continent.

On arrival in Great Britain the animals are inspected immediately before landing and are then licensed for an appropriate period to quarantine premises where they are kept under observation and subjected to further tests. If, during this final quarantine, there is an indication that an animal is infected the conditions of importation allow slaughter of that animal or of the entire consignment, or the animals may be returned to the country of origin. If deemed necessary, home-bred susceptible stock, which have passed all the tests to which the imported stock will be submitted, may be mixed with the importation in quarantine in order to act as indicators should any latent infection be present.

By insisting on these conditions, desirable strains of livestock have been successfully introduced with safety. Dutch Friesians have been imported on several occasions, as have Friesians from South Africa, polled Shorthorns from the United States and Charollais bulls from France. Sheep have come from Australia, New Zealand, Holland and Finland, and pigs from Belgium, USA and Sweden. For many years there were no importations of cattle from Australia because of the prevalence of contagious bovine pleuro-pneumonia in that country. However, in 1957 the Australian authorities were able to satisfy our veterinary conditions; these included the requirement that cattle should originate from areas free from the disease and be quarantined before export for

ninety days; in addition they had to show a negative reaction to the complement-fixation test. There have been several importations of Australian cattle under these conditions, all without incident.

Not all importations have been uneventful; on occasion evidence of disease has been detected during quarantine in this country, but the conditions of importation allow these incidents to be handled with safety. The value of rigid control of importations cannot be over-emphasised.

When animals in quarantine give positive results to tests, indicating that there has been exposure to infection, they are either slaughtered or returned, depending on the disease involved. The remaining animals may be released, retested or held for a further full incubation period before retest. For example, when the Charollais bulls were tested in the London Quarantine Station three of them gave positive reactions to the agglutination tests carried out against *Leptospira grippotyphosa*, a serotype which does not exist in this country. These animals were slaughtered and the remaining bulls were not released until further tests, repeated at intervals of three weeks to cover the incubation period, had been completed with negative results.

Although as early as 1864 mention is made of the danger of transmission of disease by the feeding of raw meat to pigs, it was not until 1926 that the full implications of this practice were appreciated. Experiments which were carried out by the Foot-and-Mouth Disease Research Committee in that year showed that the virus could survive a long time in meat and especially in bone marrow, and led to the Boiling of Animal Foodstuffs Order of 1927 which required that swill should be boiled before being fed to animals. Also in 1926 three separate shipments of pig carcasses infected with foot-and-mouth disease and originating from Rotterdam had caused primary outbreaks in the border counties of Scotland and England, with forty-four secondary outbreaks in Lanarkshire alone. This led to the Importation of Carcasses (Prohibition) Order of 1926, amended in 1927 to include bacon and ham, and subsequently giving place to the present Importation of Carcasses and Animal Products Order 1954. This Order covers, besides the carcasses of ruminants and swine, a comprehensive miscellany of animal products ranging from edible offal and sausage casings to hides, pigs' bristles and salami.

Some commodities which present no animal health risk, such as cooked meat, lard, meat meal and superphosphates derived from bone, are admitted unconditionally from all countries. From certain countries such as Australia, New Zealand, Ireland, Norway, Finland and the Union of South Africa, carcasses and animal products are permitted unconditionally. Specified products such as bones, bone meal and horns are permitted from countries outside the continent of Europe. This latter concession might appear inconsistent because anthrax may be introduced in such products, but the need to import fertilisers and feedingstuffs at times outweighs the attendant risk. Similarly,

while the possible danger from some meat and meat products is appreciated, a complete ban on imports of foodstuffs from countries which present a risk is impracticable because of the overruling need to supply the requirements of a population which cannot produce all its food at home. This basic demand sometimes becomes so overwhelmingly important, particularly in wartime, that risks normally unacceptable must be taken. There is convincing evidence that foot-and-mouth disease and swine fever reached the country in this way; and there is clear proof that Newcastle disease has done so. Of course such risks cannot be taken for luxury trade, but when they exist the best possible safeguards must be established.

Only meat from healthy animals is acceptable. It has long been an absolute rule that meat cannot be imported from countries where rinderpest is present and, in general, from areas within a country where there is any foot-and-mouth disease. In deciding safeguards against the introduction of any particular disease, regard must be given to the policy towards that disease in Great Britain. For instance, the introduction of a stamping-out policy for swine fever in this country in the early part of 1963 was accompanied by a revision of the conditions relating to importation of pig meat, and fresh and frozen pork is now imported only from countries with no swine fever, or which also have a slaughter policy and can satisfy stringent veterinary conditions.

Infection may be introduced with a number of materials such as meat wrappers, hay and straw, sera and glandular products, hides and semen and it is necessary to have regulations which will offer the maximum safeguards for their importation. The mode of introduction of disease is all too often learnt by the bitter experience of actual cases but, where feasible, speedy measures are taken to prevent recurring introductions.

An outbreak of foot-and-mouth disease in Edinburgh during 1908 was attributed to infected hay imported from Holland where disease was then rife. This led to Orders, culminating in the present Importation of Hay and Straw Order of 1955, which lists the countries from which importation is allowed. Similarly, in 1924, imported packing materials were believed to have introduced foot-and-mouth disease, whilst in 1932 an Order was made to prevent the possible introduction of the virus on meat wrappers. In 1938 a case of foot-and-mouth disease in a cow in Gloucestershire was attributed to infection having been introduced through the injection of a glandular preparation imported from a country where foot-and-mouth disease was prevalent. This incident initiated the Foot-and-Mouth Disease (Sera and Glandular Products) Order 1939. Precautions are similarly taken regarding importations of vaccines which might be contaminated by undesirable organisms.

The importation of vaccines and sera is controlled by the Therapeutic Substances Order 1952. This lays down precautions which must be taken in the manufacturing processes and stipulates safety tests which the vaccines and sera must have passed in order to qualify for an import licence. Samples of imported vaccines are submitted to

Weybridge for check test. Under this same Order, by virtue of the authority to control antigens, the importation of organisms for the purpose of veterinary research, laboratory examination, or vaccine production, may be allowed under licence and subject to conditions which will ensure that there is no risk to animal health.

It is appreciated that certain diseases may be transferred over great distances by means against which there is no possible method of protection. It is now accepted that foot-and-mouth virus may be windborne or may be mechanically conveyed by birds, especially migrants, for circumstantial evidence points to infection having been conveyed on occasions by starlings from western Europe to livestock along our eastern and southern coasts. In these circumstances the only measure which can be taken is to alert stock-owners in the areas at risk so that they may look particularly for any suspicion of the disease and report it at once—as of course they are legally obliged to do. Fortunately the very great improvement in the foot-and-mouth disease position in western Europe has greatly reduced the danger from this particular source.

IMPORTATION OF HORSES

Many horses have undoubtedly been imported over the centuries but they received little attention in disease-control legislation until 1874 when inspectors, stationed at ports where Irish animals could be landed, were instructed to inspect horses and all other livestock. By 1921, when the incidence of glanders in this country had been reduced (only eleven cases occurred in that year), it was advisable to control the trade in pit ponies from Russia. Consequently, the Importation of Horses, Asses and Mules Order of 1921 required that each such animal imported into Great Britain must be certified free from specified diseases and must have passed a mallein test within ten days before shipment. Racehorses, performing horses and those for re-export within fourteen days were exempt from the test but had to be accompanied by a veterinary certificate of health. The present Importation Order of 1957 and its amendments continue these requirements but, because of the emergence of African horse sickness, importation is prohibited from certain specified countries mainly in Asia, the Middle East and Africa.

The majority of horses imported into Great Britain come from Ireland, which, together with the Channel Islands and the Isle of Man, is exempted from the regulations.

IMPORTATION OF POULTRY

It was only in post-war years that the dangers associated with the introduction of poultry, including hatching eggs and carcasses, led to the regulation of imports. In 1947, immediately on the resumption of the importation of poultry carcasses from Poland and Hungary, Newcastle disease was introduced into this country and spread widely, with

high mortality. That the frozen carcasses were responsible for carrying the infection was shown at Weybridge by isolation of the virus from them. The supply position did not allow a complete ban but, since importation was at that time under government control, the situation was dealt with by the importation thereafter of eviscerated carcasses only. During the same year the Order requiring the boiling of waste food was extended to include waste food fed to poultry.

Under the Poultry Carcasses (Importation) Order 1950, replaced in 1955 by the Poultry Carcasses (Landing) Order, importation of uncooked poultry carcasses was prohibited from countries where Newcastle disease was endemic.

The Poultry and Hatching Eggs (Importation) Order of 1947 prohibited the landing of live poultry and eggs for hatching from countries outside the British Isles where Newcastle disease existed and permitted landings from elsewhere only under licence and upon production of health certificates.

It became evident, however, that the requirements of this Order were being evaded and that illegal importations of eggs were taking place, probably stimulated by the great expansion and keen competition that had occurred within the industry. The Departmental Committee on Fowl Pest Policy, which reported in 1962, recommended that the Ministry should facilitate the import of hatching eggs under supervision wherever the commercial interest was likely to be furthered by the introduction of new breeding stock. This recommendation was accepted and the Poultry and Hatching Eggs (Importation) (Amendment) Order 1963 gave the Minister power to grant licences to import poultry and hatching eggs from hitherto prohibited countries. Several importations under this Order have been made and stringent conditions are laid down which require comprehensive health certification concerning the flocks of origin and strict quarantine in approved premises after arrival in this country. Close veterinary supervision is maintained during the quarantine period and laboratory tests are carried out for infections such as pullorum disease and mycoplasmosis.

IMPORTATIONS TO ZOOLOGICAL GARDENS

In the importation of animals for zoological gardens particular care is directed against the possible introduction of exotic diseases which could have serious effects on domestic animals and might have public health significance. Regulations have been in force to control the importation of ruminants and swine since the last century and, under separate Orders, imported zoological specimens are kept under special conditions to ensure isolation comparable to quarantine.

Members of the canine and feline species have to be isolated for six months as a precaution against rabies. To guard against foot-and-mouth disease and rinderpest in particular, the importation of ruminants and swine is allowed only to urban zoos, where the animals are detained in quarantine under close veterinary control for twenty-eight

days and thereafter must remain on the premises for eleven months. At the end of that period they may be moved under licence to other zoos. The detention for twelve months away from any possible contact with domestic stock is a safeguard against the possibility that the animals may be affected by other diseases with a long incubation period such as pleuro-pneumonia or by some latent viraemic or blood parasitic condition.

These are stringent precautions but are justified because they are designed to protect the farm animals in Great Britain.

Since 1961, as an added precaution, ruminants from countries where blue tongue exists are maintained in quarantine for fifty-six days on premises which are adequately fly-proofed with nylon mesh.

IMPORTATION OF DOGS AND CATS

The number of dogs and cats imported into Great Britain continues to increase: in the 1920's the number of dogs passing through quarantine annually was around 800 but the number had risen to over 3,000 dogs and 500 cats in 1962.

The need for legislation to control rabies in this country was recognised in the later years of the nineteenth century. Restrictions on dogs imported from abroad were introduced as a result of a recommendation by a departmental committee which was appointed in 1896 by Lord Long (then Mr. Walter Long), at that time President of the Board of Agriculture. The Importation of Dogs Order 1897 prohibited the landing of a dog in Great Britain from abroad except by licence of the Board, and the licence required that the dog should be detained and isolated for six months on premises provided by the owner. If the dog had been under the personal control of the owner for at least three months before landing it could be kept for the required period on the owner's premises, provided it was muzzled when taken out for exercise. Dogs acquired from dealers, or which had not been under the owner's personal control before importation, had to be detained and isolated on the premises of a veterinary surgeon.

In a large number of cases these regulations were evaded: some unmuzzled dogs were allowed their freedom during the prescribed period of detention, and in many cases imported dogs were entirely lost by their owners during this period. Soon it became evident that to permit imported dogs to be detained on the owner's private premises did not ensure quarantine in the true sense or constitute an efficient means of controlling imported dogs and that therefore it provided no defence against the introduction of rabies into this country. Accordingly, the Importation of Dogs Order of 1901 required dogs landed from abroad to be detained and isolated for six months on premises under the control of a veterinary surgeon, and completely separate from their owners. The principle of quarantine under separate veterinary control has been enforced ever since that date.

In consequence of the increasing prevalence of rabies amongst cats on the continent of Europe and elsewhere, the Importation of Dogs and Cats Order of 1928, which still remains in force, required, for the first time, that all imported cats and other members of the feline species should be quarantined for six months on veterinary premises as in the case of dogs.

Since 1901 the quarantine period has been six months, except from November 1914 to November 1918 when it was reduced to four months. It became evident, however, that many cases of rabies occur abroad in which the incubation period exceeds four months, but cases of over six months incubation are very exceptional and it is not considered practical to legislate for these. Experience has, in point of fact, abundantly justified the six-months quarantine period. Since 1924, twenty-three cases of rabies have occurred in imported dogs, and in only three cases did disease appear after the six-month period of detention had been completed. All three fortunately occurred while still in quarantine kennels.

It is not without interest to recall how, in 1918, rabies was reintroduced by an animal smuggled into this country and during the next three years 144 people who had been bitten by suspected dogs had to undergo the Pasteur method of preventive vaccination—a painful and prolonged ordeal. That they had been exposed to real risk is shown by the fact that 123 of the dogs involved in these incidents were found on laboratory examination to be affected with rabies. It can be readily appreciated how alarmed the dog-owning public were by these outbreaks, and how deep was the anxiety following a dog-bite lest the victim should develop hydrophobia. If rabies again appeared in this country the problem of its eradication could well be more serious than in 1921, for the dog population has greatly increased.

From time to time there have been attempts by some sections of the general public, with some support from the Press, to secure relaxation of the six months quarantine period in respect of imported dogs which have been vaccinated. Whilst it is recognised that vaccination with other control measures has proved of considerable benefit in controlling and eradicating the disease in countries where rabies was rife, it is also known that no vaccine is 100 per cent effective and, in a country which is free from disease and has no land boundary, no chances can be taken. The present policy has kept the country free from disease since 1922 and it would be wrong to change the procedure unless and until an equally efficient method can be found to replace it.

EXPORTATION

GREAT BRITAIN has long been recognised as a leader in the improvement of livestock and consequently there has been a great demand for our pedigree animals throughout

the world, but in conducting an export trade in animals many problems have to be faced to meet the animal health requirements of importing countries.

The difficulties associated with this trade particularly interested the President of the Board of Agriculture and Fisheries in 1910 when he appointed a committee 'to enquire and report as to the character and extent of the British Export Trade in livestock (including horses and poultry) with the Colonies and other countries and to consider whether any steps could with advantage be taken by the Board of Agriculture or otherwise with a view to its development'. The Committee could not obtain accurate information on the extent or character of the trade but it was estimated that in 1900 some 2,750 cattle, 5,000 sheep and 450 pigs were exported and in 1910 the numbers were nearly doubled; in addition there was a large export trade in horses, mainly to Belgium, for slaughter. The various veterinary requirements of importing countries were discussed by the Committee and in particular the difficulties experienced in satisfying importing countries about the freedom of cattle from tuberculosis. When the Committee reported in 1911, two of its sixteen recommendations were of particular importance and they probably materially influenced the approach to the trade in later years: they were that there should be no relaxation of the existing livestock *import* regulations designed to prevent the introduction of contagious animal diseases into the country; and that consideration should be given to the establishment of an official station for the testing of livestock before export.

The former recommendation has remained a cardinal principle of our animal health controls. The latter was accepted and a grant was made for the erection of the Government Cattle Testing Station at Pirbright in Surrey. This was completed in 1913 but, owing to the outbreak of war, it was not opened until September 1919: by the end of that year 109 animals had entered the station, thirteen for immunisation against redwater of cattle and the remainder for the tuberculin test. Owing to the very serious epidemic of foot-and-mouth disease in the early 1920's, and its effect upon the export trade, the number of cattle passing through the station fell rapidly and it was closed in 1924. The premises were taken over in 1925 as the Foot-and-Mouth Disease Research Station.

As the disease position improved, the Ministry, in co-operation with the Royal Agricultural Society of England and the Empire Marketing Board, decided in 1927 to set up a quarantine station in London where animals intended for export could be maintained for fourteen days in rigid isolation under the control of a veterinary officer of the Ministry. Strict health conditions for entry of animals were laid down by the Quarantine Station Regulations Order of 1928. The RASE undertook the responsibility of establishing and administering the station and the Ministry provided veterinary supervision. From its inception the station proved a boon to exporters generally and 333 animals were quarantined in 1928; in the following year the number rose to 643.

The staffing and management were transferred to the Ministry in 1934. The station was closed during the Second World War and re-opened in 1946. It was transferred to new premises in 1947 but due to lack of use, largely because of the cessation of export to Australia in 1958, the station was closed in 1961 and is now only used very occasionally as a quarantine station for imported pedigree stock.

Two other quarantine stations have also been operating, one at Glasgow since 1941 and the other at Liverpool since 1945. The Glasgow station is used mainly for animals destined for Canada whilst the Liverpool station has been used almost exclusively for animals being exported to New Zealand and to the Irish Republic. In the period 1928 to 1963 some 33,000 head of livestock (cattle, sheep and pigs) have passed through these stations; this routine has enabled the continuation of a valuable export trade free from the risk of the transmission of foot-and-mouth disease. The quarantine facilities are available for exports to any country requiring them.

As already indicated, the chief animal health obstacle to exports in the past has been the fear of carrying foot-and-mouth disease to the importing country. Some countries have been satisfied by our certificate of freedom from disease of the district of origin, while others insist on the country being free from infection for a period of time; in addition, quarantine before export is often required. Of course the longer the country remains free from disease the more likely these obstacles are to be reduced.

Various requirements may also be laid down about the nature of the tests which the importing countries carry out to detect infections, such as tuberculosis, brucellosis and Johne's disease. Some of these tests may present difficulties in interpretation as, indeed, occurred with animals failing the Johne's tests in the Canadian quarantine station after having passed the tests before leaving Great Britain. To overcome this discrepancy, Canadian johnin has since been used in animals before export to Canada.

There do remain, however, some barriers which are at present insuperable. In particular, scrapie, which occurs in sheep in this country and which may have a very long incubation period, prevents exports of sheep to Australia and New Zealand. Australia also bars our cattle because of the risk the authorities in that country consider to exist of the introduction of blue tongue. The virus which causes this disease of sheep, and which is spread by flying, biting insects, can also be carried in the blood of cattle. Although the United Kingdom is free from blue tongue the Australians are not satisfied that there is no risk, because the disease has occurred in Spain and Portugal, and they fear its spread and unrecognised existence elsewhere. The Animal Health Division regards this risk as extremely remote but, in this as in all decisions upon the introduction of animals into any country, it must be the importing country which has the last word in assessing disease risks and deciding which animals it will accept.

SOUTH AMERICA

TRADE between the United Kingdom and the Argentine Republic developed following the declaration of Argentine Independence in 1816. British imports were primarily agricultural and included, at various times, live animals, meat and a variety of animal products which were always accompanied by problems relating to animal health. In 1900, for example, foot-and-mouth disease was discovered in live cattle and sheep on arrival from the Argentine and in many primary outbreaks of that disease in Great Britain infection was attributed to imported meat from South America. In 1927 the Argentine Government, together with the Governments of Uruguay and Brazil, agreed to the visit of a senior veterinary inspector from time to time and, with the exception of two periods between 1931 and 1943, the Ministry has had at least one veterinary representative stationed in Buenos Aires. The functions of these veterinary officers have been to collaborate with the governments and the veterinary services in solving any difficulties which might arise in the local application of conditions agreed upon for the purpose of lessening the chances of infected cattle reaching the *frigoríficos* or packing houses, and to prevent the export to Great Britain of animals killed in the infective stage of the disease or of animals which had been in contact with them.

Foot-and-mouth disease was first recognised in Argentina in 1870 and it has remained endemic with varying severity until the present time. The frequent movements of cattle for wintering and for sale through fairs and markets tend to maintain infection and greatly facilitate the spread of disease.

There was a marked improvement in Argentine agriculture during the second half of the nineteenth century, but it was not until well into the twentieth century that this achievement became apparent. Three prime factors influenced this important advancement. Firstly, the inauguration of the Argentine Rural Society by a group of forward-looking and enterprising agriculturists in 1866 had a far-reaching effect in the improvement of livestock and cereal production. Secondly, the construction of the railways, begun in 1857, had by 1880 reached the stage of furnishing the present livestock zones and grain-producing districts, which had progressively developed out of the sheeplands, with an adequate network of permanent way for the transport of their produce. The railways also enabled agriculturists to induce immigrants on to their land to break up the old pasture and grow wheat and maize on a profit-sharing basis for several years, after which the land was sown to alfalfa for the purpose of fattening cattle. Thirdly, the invention of refrigeration for the purpose of preserving meat, which led to the construction of the first Argentine freezing plant in 1882, allowed the exportation of frozen lamb and mutton to become a successful and established practice.

Until this time there had been little incentive to improve the native cattle because

the only markets available were the salting plants which demanded a five-year-old steer with a thick hide and poor flesh so as to be easily salted. Cattle at the age of four or five years possessed all the qualities required for an industry which was limited to the exportation of hides, tallow and salted beef. Exports of salted beef reached their peak in 1895.

During the last decade of the nineteenth century live cattle and sheep were exported to the United Kingdom. This trade, which by 1898 had reached nearly 100,000 head of cattle and nearly half a million sheep, came to an abrupt conclusion in 1900 owing to an outbreak of foot-and-mouth disease. During eight days at the beginning of April, 3,793 cattle and 29,742 sheep were landed, of which 1,561 cattle and 4,014 sheep were found to be affected on landing and 2,737 cattle and 1,871 sheep were lost at sea from the disease. Immediately on discovery of the first affected consignment an Order was made prohibiting any further importation of live animals from Argentina. Frozen beef was shipped to Great Britain from about the turn of the century and, together with chilled beef, the quantity increased steadily up to 1927.

Following the publication of the Second Progress Report of the Foot-and-Mouth Disease Research Committee discussions took place in Parliament and the Press as to the extent of the risk of the introduction of infection into Great Britain by meat brought from South America. After consultations in London with the Argentine Ambassador and his advisers certain conditions were agreed upon, but it was concluded that any measures to prevent the shipment of infected carcasses must be applied in South America where inspectors would have the advantage of seeing the animals when alive and immediately after they had been slaughtered. In May 1927 a British veterinary officer took up station in South America. He made a complete study of trade conditions and the disease situation, not only in Argentina, but also in Uruguay and Brazil, and suggested some modification of the original conditions agreed upon in London. By the end of the year it became obvious that the presence of someone having political knowledge and authority was necessary in South America to explain to the authorities of each country the British attitude towards the suggested control of the cattle trade, and to create an atmosphere in which all persons interested in the trade would heartily co-operate to prevent carcasses of diseased animals being shipped to Britain. On the invitation of the Minister, Lord Bledisloe agreed to undertake a mission to visit all three countries to modify, if necessary, and finally ratify the agreements which were awaiting final adjustment.

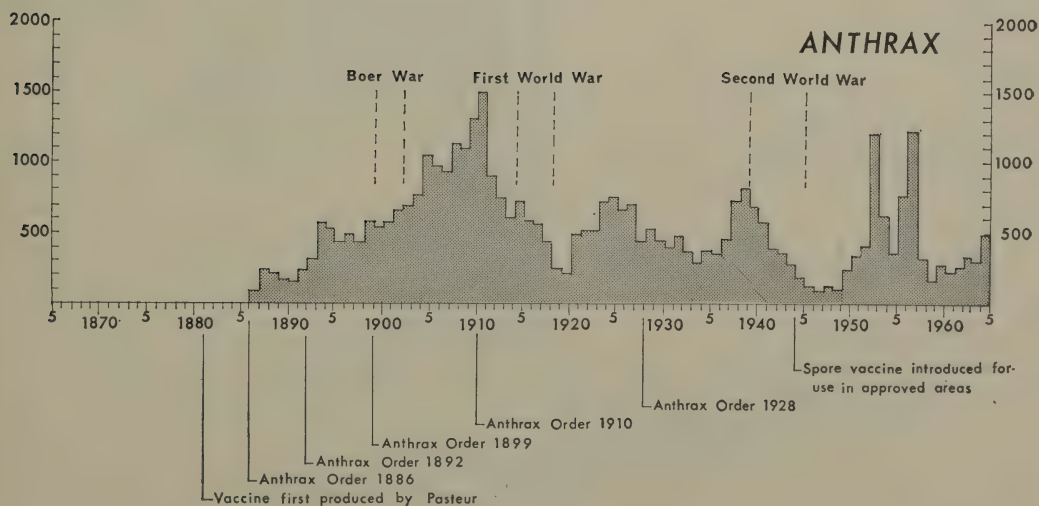
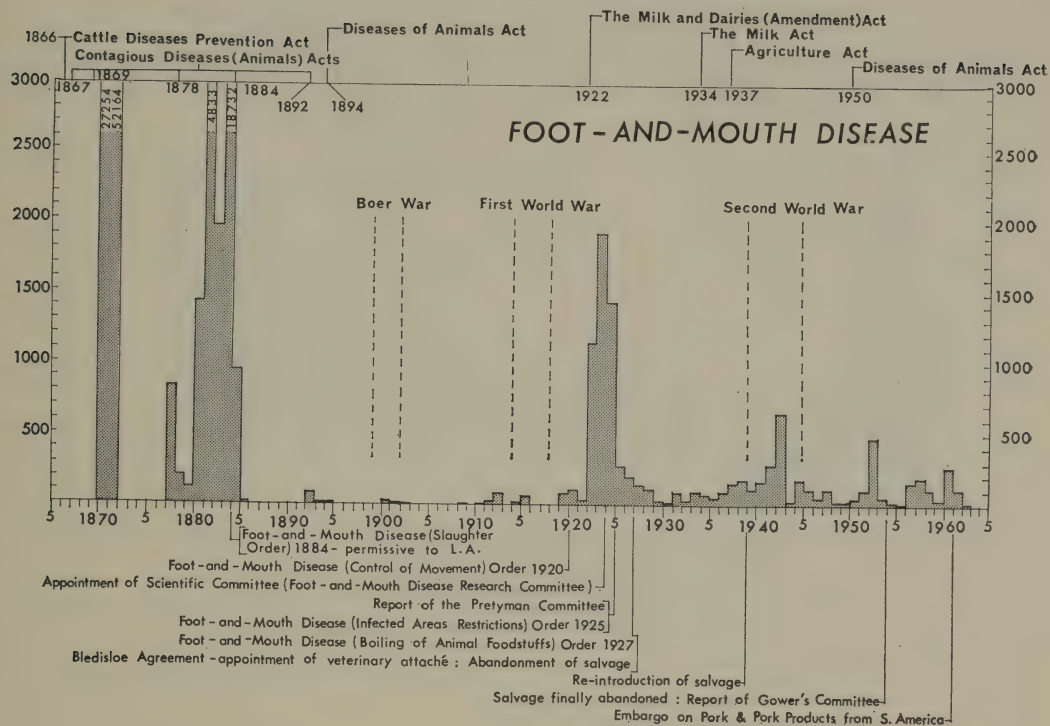
Lord Bledisloe arrived in Buenos Aires in January 1928 and found that, except at the packing-houses, there was little or no organised attempt to control the spread of foot-and-mouth disease, and he formed the opinion that any attempt to impose too drastic regulations and penalties immediately upon countries wholly unused to such control would defeat its own object. The critical clauses of the so-called Bledisloe

agreement, and included in the Argentine decree, were that no carcasses of affected animals or of animals which have been in contact with diseased animals shall be exported to Great Britain.

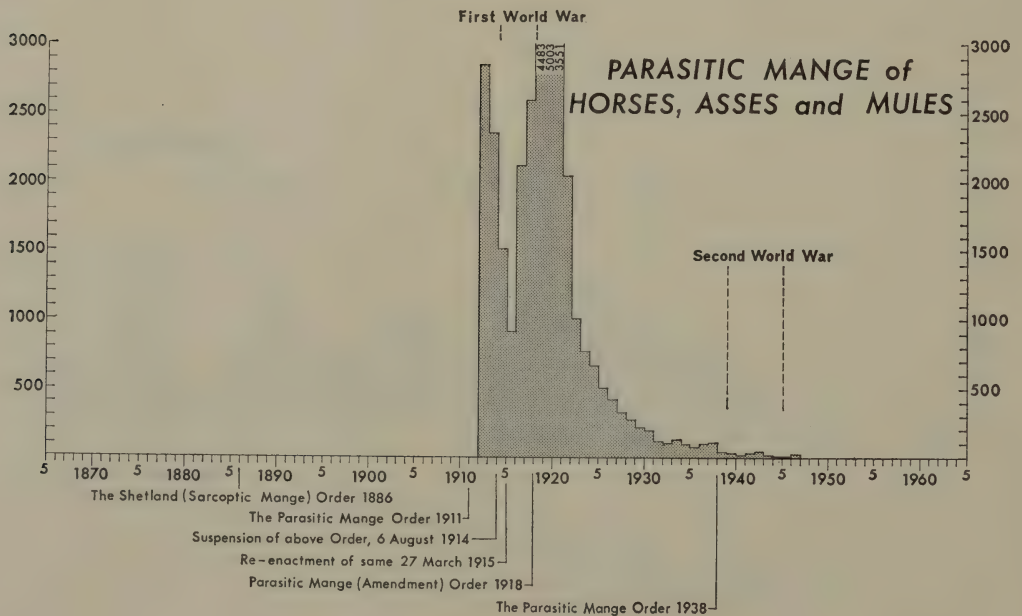
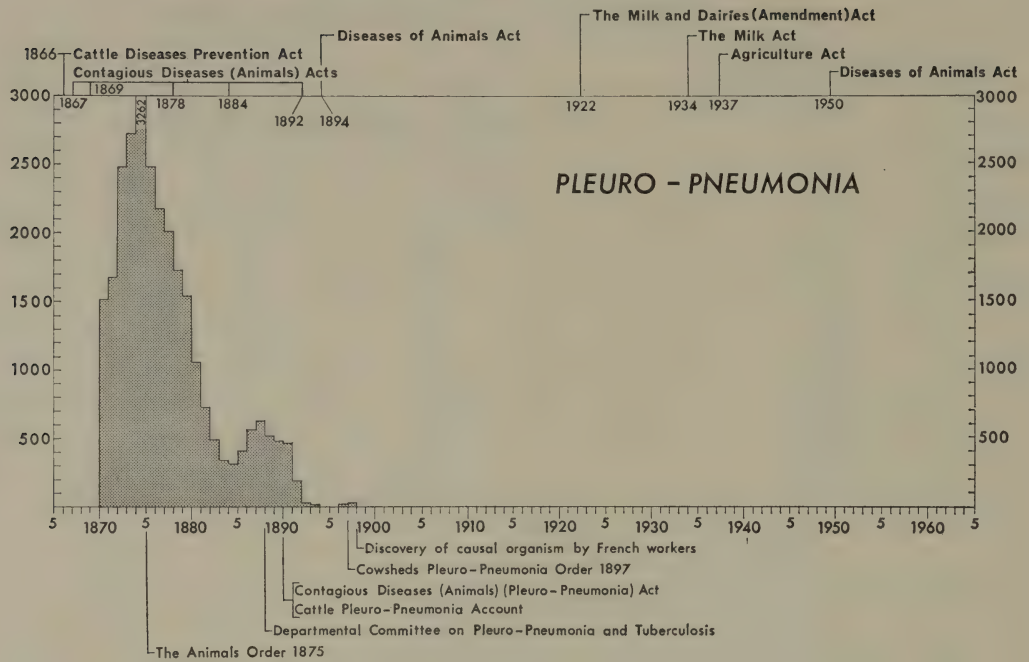
The eradication of foot-and-mouth disease by stamping-out in such countries as Argentina is impracticable under prevailing conditions. It is probable that livestock producers would not co-operate in a slaughter policy; infection is widespread; there are difficulties in applying controls, and the extensive system of livestock husbandry allows ready contact between animals in different ownership. The first stage, therefore, in controlling the disease in South America is by vaccination. Field trials with vaccines produced by private laboratories began in 1942, and five years later many types of vaccine were on the market.

Vaccination on a voluntary basis continued until 1960 when, following the ban imposed by Great Britain on the importation of pork and pig products, there was considerable apprehension that a ban on beef exports might follow. Moreover, if Argentina is ever to capture a North American market it can only do so if foot-and-mouth disease has been completely eradicated. A Board to control and eliminate the disease was accordingly set up. In the early stages many breakdowns occurred but deficiencies in the vaccines were rectified with the assistance of the Pan-American Foot-and-Mouth Disease Centre at Rio de Janeiro, Brazil, and the campaign is now making progress. Vaccination is now compulsory three times per annum for approximately 90 per cent of all cattle in the Republic.

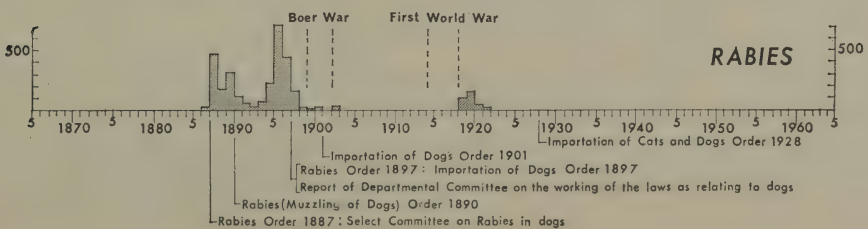
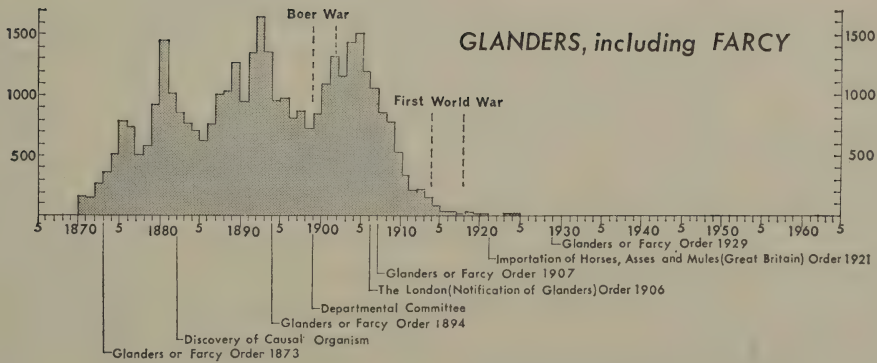
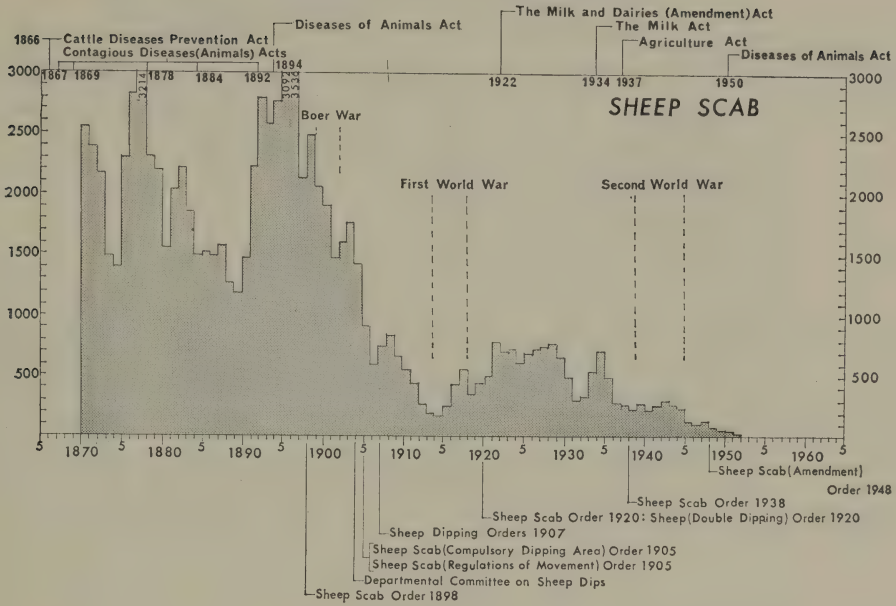
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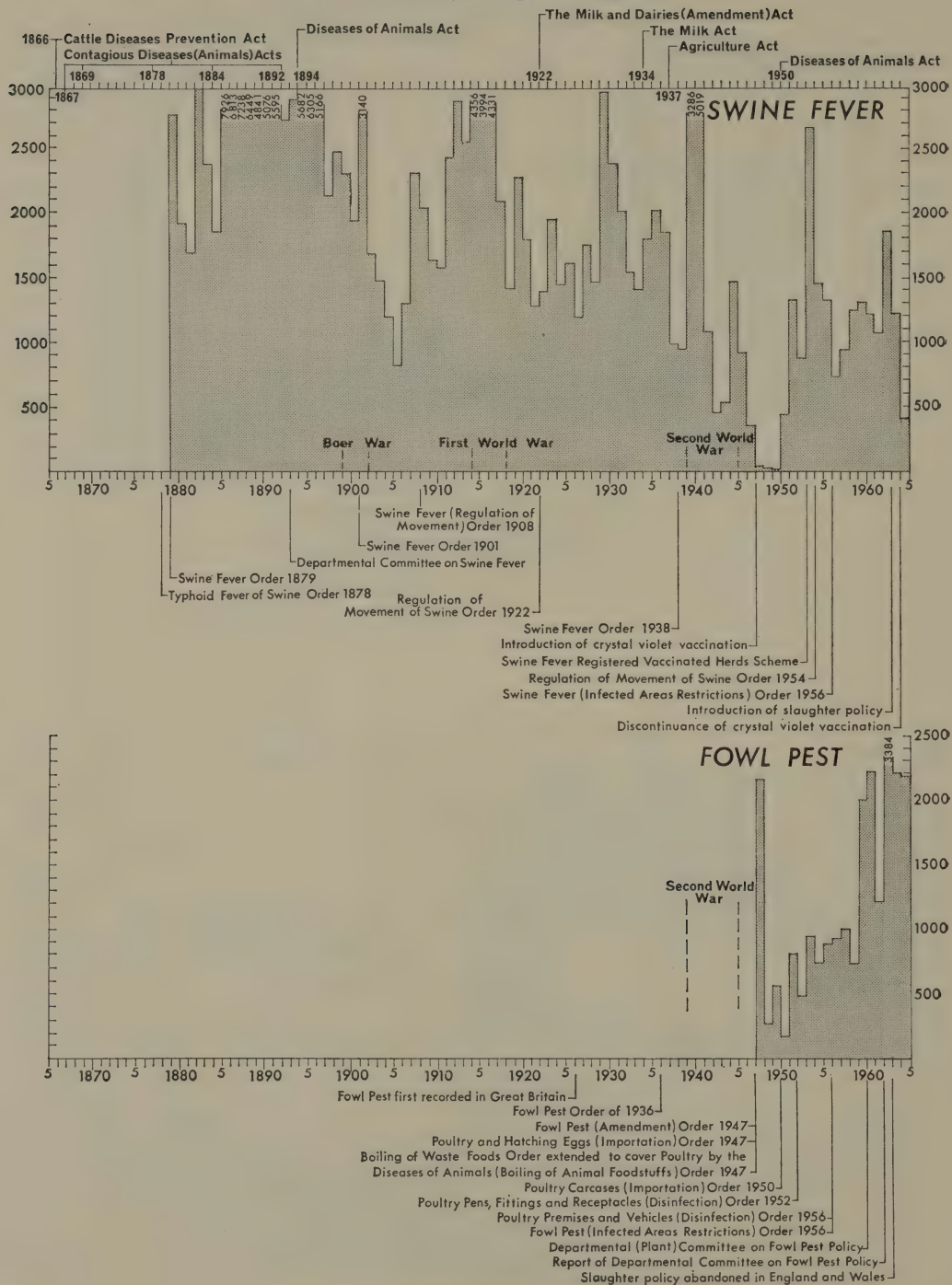
THE INCIDENCE OF DISEASE



THE INCIDENCE OF DISEASE



THE INCIDENCE OF DISEASE



Chapter 3

Co-operative Measures

MEAT HYGIENE

THE legislation of the early and middle parts of the nineteenth century contains few specific references to the inspection of meat, although the Nuisances Removal and Disease Prevention Act of 1855 makes reference to the duty of inspecting articles intended or exposed for sale for the food of man. The earliest comprehensive legislation in England and Wales was the Public Health Act of 1875 which empowered medical officers of health and inspectors of nuisances (later known as sanitary inspectors and now as public health inspectors) to seize unsound meat and also unsound animals. The 1875 Act was followed by the Public Health (Amendment) Act of 1890.

About this time the scientific work of Pasteur, Koch and others drew attention to the fact that many human and animal diseases could be passed from one species to another. It became apparent that the consumption of milk and meat from tuberculous animals could transmit the disease to man and the Government of the day appointed a departmental committee which reported in 1888 that, 'although the bacilli may be found but rarely in the flesh, still the chance of their being present either there or in the blood is too probable to ever allow of the flesh of a tubercular animal being used for food under any circumstances, either for man or the lower animals'.

This Report led some medical officers to make full use of the powers granted to them by the 1875 Act, and condemnations of meat in certain parts of the country were so numerous that farmers and meat traders made representations to the Government. Accordingly the first of the Royal Commissions on Tuberculosis was appointed to report on 'the Effect of Food derived from Tuberculous Animals on Human Health'. The Commission, reconstituted on the death of the chairman in 1894, finally reported in 1896. Its conclusions were that meat from animals affected with advanced tuberculosis will in many cases give rise to tuberculosis in animals fed on such meat; that meat from animals affected with mild or moderate tuberculosis will not normally give rise to tuberculosis if all affected parts are removed and no contamination of the unaffected portions of the meat takes place; that contamination of sound meat during slaughtering and dressing operations constitutes a very real danger, and that cooking of meat, particularly grilling or roasting of large pieces, will not render infected meat safe.

The Report of the Royal Commission revealed that routine meat inspection was being undertaken only in a few local authority areas and that the standard of inspection varied; in fact the powers granted in the Act of 1875 were not being generally applied and most inspectors of meat were not properly trained for the job, though before 1895 veterinary surgeons were carrying out meat inspection in at least two cities in England and two in Scotland. To improve the training of inspectors of nuisances the Royal Sanitary Institute (now the Royal Society of Health), which was already conducting a basic course of training and an examination, instituted in 1899 a special examination for inspectors of meat and other foods. A pattern of meat inspection was thus established at the turn of the century which continued with little change until the outbreak of the Second World War.

In 1920 the Minister of Health appointed a departmental committee to inquire into the subject of meat inspection in England and Wales. Following this inquiry the Minister issued Memo 62/Foods, a memorandum for the guidance of meat inspectors, which recommended in detail the procedure to be used in examining carcasses. Unfortunately this did not result in routine meat inspection becoming generally enforced by local authorities. In an effort to achieve this the Public Health (Meat) Regulations 1924 required butchers to notify the times of slaughter and to retain carcasses for a short period to await inspection. That these regulations did not wholly achieve the desired effect is confirmed by reports that 375 tons of diseased English meat had to be seized in the Borough of Finsbury alone between 1924 and 1931, and that 120 tons of such meat had been condemned in Smithfield market in 1929 and 1930. Most of this meat came from rural areas.

Before the Second World War there were some 12,000 operative slaughterhouses in England and Wales. Many were privately owned in conjunction with retail butchers' businesses. Of the relatively few large slaughterhouses some 120 were owned by local authorities and more than 70 by co-operative societies.

The war brought great changes because the Ministry of Food became the sole buyer of livestock for slaughter and the sole slaughterer and wholesale distributor of meat for human consumption, with the exception of certain unrationed meats such as horseflesh and poultry.

Towards the end of the meat rationing period the Ministry of Food was using less than 500 slaughterhouses, excluding bacon factories, in England and Wales, and this, for the first time, made it a practical possibility to inspect all meat. The Ministry, anxious that inspection should be uniform and thorough, agreed with the Ministry of Health to establish its own cadre of technical advisers under a veterinary surgeon to maintain a close liaison with the local authority meat inspectors and provide them with expert advice.

Departmental responsibility for food inspection and hygiene was transferred in 1948

from the Ministry of Health to the Ministry of Food by the Transfer of Functions (Food and Drugs) Order of that year and for the first time the Minister responsible for meat inspection was advised on this matter by veterinary surgeons on the staff of his Department. The Ministry of Food and the Ministry of Agriculture and Fisheries merged in 1955 and the new Ministry continues this responsibility.

An interdepartmental committee set up in 1949, with G. R. Oake as chairman, reported in 1951 and made a number of recommendations designed to achieve an efficient and uniform system of meat inspection and a high level of hygiene in slaughterhouses and in the meat distribution chain. Some of these recommendations have formed the basis of subsequent legislation and others may still be adopted in the future. One of the first practical results of the Committee's report was that Memo 62/Foods which, although it had no statutory authority, had laid down the system of meat inspection, was replaced in 1952 by the more up-to-date Memo 3/Meat.

Early in 1953 another interdepartmental committee, with R. Herbert, CB, CMG as chairman, was appointed to study the possibility of maintaining permanently a concentration of slaughterhouses using about half the number of premises operated by the Ministry of Food. However, in the autumn of that year it became apparent that supplies of meat were becoming sufficiently plentiful to allow de-rationing to take place within a relatively short time and so the Committee was asked to advise urgently on how the necessary slaughtering accommodation could be made available to allow the trade to resume its pre-war responsibilities. An interim report was published in January 1954 recommending that no restrictions should be placed on the re-licensing of slaughterhouses except where local facilities were already sufficient. Some 4,000 additional slaughterhouses were brought into use in July 1954.

The final report of the Committee was published in the following year and confirmed most of the views expressed in the interim report. It recommended that the provision of slaughtering facilities should be allowed to develop according to the requirements of the trade, and that slaughterhouses should conform to certain minimum standards in respect of facilities for the humane slaughtering of animals, for the adequate performance of meat inspection, for the hygienic processing of meat and for the safety, health and welfare of workers. All existing slaughterhouses should, in time, be brought up to these minimum standards. These recommendations became government policy and, with a few minor changes, are now embodied in the Slaughterhouses Act 1958.

It was recognised by the Committee that there would be difficulty in providing a meat inspection service, with some 4,500 slaughterhouses, and that there would be an unfair burden on some authorities who were responsible for inspecting meat consumed in other areas. It therefore recommended that local authorities should be empowered to make a charge for inspection upon the owner of the meat. This recommendation

was not adopted but, since April 1956, the Government has made grants to those authorities which could show that they inspected more meat than they consumed. For one reason or another this did not achieve the desired effect of ensuring that all meat was inspected at the point of production.

Finance was a major difficulty, but there was also a shortage of suitably qualified inspectors. The number of whole-time veterinary meat inspectors has markedly declined since 1938, partly because local authorities are unwilling to pay enough, and partly because, to many, this work is unattractive. Meat inspection is largely done by public health inspectors but they, too, are reluctant to specialise in meat inspection. To relieve the shortage, regulations were made in 1960 authorising a new class of meat inspector. These officers are required to undertake a course of training and pass an examination similar to the examination in meat inspection taken by the public health inspector. Recruits have come mainly from the meat trade and about thirty have qualified each year.

To achieve the Government's stated aim that all meat should be subjected to a thorough post-mortem inspection, the Meat Inspection Regulations 1963 came into operation in October of that year. Local authorities were permitted to make charges and the unsuccessful government grant was stopped. Briefly, the main principles in these regulations are that the carcase and organs of every animal slaughtered for human consumption must be inspected at the place of slaughter, with special provisions for casualty animals; uninspected meat must not be taken from a slaughterhouse but, for a two-year period, may be removed after six hours, but not at night; meat that has been passed as fit must be marked with a stamp of the inspector of the local authority; the minimum period for giving notice of slaughter is extended to twenty-four hours. The standard procedures for inspection are laid down in the regulations which are very similar to those recommended in Memo 3/Meat but they now have statutory force.

The effectiveness of these regulations in practice will be critically studied in view of a recommendation of the Committee of Inquiry into Fatstock and Carcase Meat Marketing and Distribution (with Sir W. R. Verdon-Smith as chairman) made in January 1964 that a Fatstock and Meat Authority should be set up which should operate a Central Meat Inspection Service carrying out 100 per cent ante-mortem and post-mortem inspection to a standard uniform throughout the country which should be under sufficient veterinary supervision to satisfy foreign as well as home buyers.

Meantime the implementation of the Government's policy on slaughterhouses has resulted in a decrease in the number of slaughterhouses from over 4,500 in the summer of 1954 to about 2,450 in April 1964. Those premises which continue to operate have been greatly improved and useful liaison has been established between officers of local authorities and the veterinary field staff of the Ministry.

Legislation made in 1958 gave effect to the Government's slaughterhouse policy for England and Wales. The Slaughter of Animals (Prevention of Cruelty) Regulations 1958, and the Slaughterhouse (Hygiene) Regulations 1958 were, as their titles indicate, designed to raise standards of humane treatment of livestock and of hygiene. Although it was for local authorities to give effect to this legislation, the Ministry's veterinary staff had a two-fold part to play. They were, and are, available to local authorities for consultation and advice and in this capacity they have been able to help local authorities to obtain a uniform application of the regulations in widely separated localities. They have also been a channel of information and intelligence to provide the Minister with up-to-date assessments of the developing situation and have provided technical advice to local authorities in connection with their plans for new public slaughterhouses.

In an emergency the Ministry's veterinary staff act as authorised officers of the local authority for the purpose of implementing the Meat Inspection Regulations of 1963.

MEAT INSPECTION IN SCOTLAND

Government policy on meat inspection in Scotland has differed from that in England and Wales in several important respects. In the first place the local government responsibility has rested on larger units, the county councils and the councils of large burghs and, secondly, the legislation has encouraged public ownership of slaughtering facilities. It was therefore possible to introduce compulsory meat inspection in Scotland some thirty years earlier than south of the border.

The Burgh Police (Scotland) Act 1892 and the Public Health (Scotland) Act 1897 gave powers to local authorities to make bye-laws for the management of slaughterhouses and required them to license all slaughterhouses; it became an offence to slaughter animals for food elsewhere than in licensed premises. Any medical officer, sanitary inspector or veterinary surgeon, approved for the purpose by a local authority, was empowered to inspect and examine any animal or carcase intended for human food. Most local authorities took advantage of these powers to make bye-laws but not all appointed enough meat inspectors to ensure a uniform standard of inspection throughout the country. The Local Government Board therefore appointed a commissioner before the First World War to enquire into the possibility of establishing a uniform system of meat inspection; this work was interrupted by the war but in 1919 three expert committees submitted reports to the Scottish Departments. These served as a basis for the Public Health (Meat Inspection) Regulations (Scotland) 1923 which were brought up to date in 1932. The regulations laid down methods of inspection and standards of judgment and led to a marked improvement in meat inspection.

These regulations increased veterinary participation in meat inspection and established the place of the detention officer who was trained to carry out routine inspections and to detain suspect carcasses for subsequent examination by the meat inspector.

In 1938 the Ministry of Agriculture and Fisheries undertook, through its veterinary officers, to carry out meat inspection in those local authority areas where the veterinary meat inspector had been transferred to the Animal Health Division. At first, eleven local authorities availed themselves of this arrangement, and one was added later; six local authorities have now ceased to make use of the Ministry services. Since 1938, therefore, meat inspection has been by the Ministry's veterinary staff at agreed fees for the local authorities of the City of Aberdeen, the Burgh of Dumbarton and the counties of Caithness, Dumfries and Fife and, since 1946, the county of Angus, and for a shorter period in others.

In 1955, at the request of the Department of Health for Scotland, it was agreed that general supervision of meat inspection and slaughterhouse procedure from the veterinary angle would be by the veterinary staff of the Animal Health Division. Regular inspections of slaughterhouses are made by regional veterinary officers and deputy regional veterinary officers who, however, have no statutory powers. When contraventions of existing legislation are found, details are passed to the Department of Home and Health which takes appropriate action.

In 1961 ante-mortem inspection of all animals in slaughterhouses, except in certain remote areas, became a statutory requirement.

STOCK IMPROVEMENT PLANS

POULTRY STOCK IMPROVEMENT PLAN

Visions of an idyllic country existence, coupled with the monetary incentive offered by the high price of eggs, stimulated the rapid expansion of the poultry industry after the First World War. Many ex-Service men, totally or partially ignorant of poultry-keeping, entered the industry, and their numbers were later augmented by unemployed or under-employed workers attracted to poultry-keeping as a sideline during the industrial depression. During these years of unprecedented demand for poultry stock, hatching eggs and day-old chicks, the industry developed haphazardly and scant attention was paid to the basic principles of breeding, disease control and hygiene. Consequently the death rate, especially from pullorum disease or bacillary white diarrhoea (BWD), increased to such an extent that a critical situation was created in the industry in the late 1920's and early 1930's. Many poultry-keepers throughout the country experienced losses of such crippling severity that they were driven out of business.

Such was the position when, in 1932, a number of prominent poultry-farmers in south-west England produced a scheme for stock improvement. The following year

their suggestions were officially sponsored by the Ministry of Agriculture and incorporated into a voluntary scheme known as the Accredited Poultry Breeding Stations Scheme. Included prominently in the rules for the scheme was free annual blood testing for the detection of pullorum disease. This important feature of the scheme was designed to detect and destroy the apparently healthy carrier and was accepted, along with general advice on disease control, as the responsibility of the Ministry.

In 1935, two years later, the Accredited Hatcheries Scheme was introduced to supplement the Breeding Stations Scheme. The entry of hatcheries, with the condition that their supplies of eggs were to be obtained from blood-tested poultry stocks, was an obvious and complementary part of the first scheme. From 1933 until 1944 the schemes were carried out on behalf of the Minister by the county agricultural education authorities but in 1945 the Ministry, through the Poultry Division, took administrative control and, under the Agriculture Act of 1947, the poultry instructors of the local authorities were finally incorporated in the National Agricultural Advisory Service as poultry advisory officers. The two schemes were replaced by the Poultry Stock Improvement Plan in 1948.

Scotland had recognised earlier than England and Wales the need for organised schemes for poultry improvement and disease control. The Secretary of State had appointed a departmental committee to report on poultry-breeding in Scotland as early as 1909. From 1912 until 1937 the Scottish Board of Agriculture (subsequently the Department of Agriculture) operated a scheme under which a bonus was paid to owners of stations approved for the distribution of hatching eggs and day-old chicks.

In 1936 the Poultry Technical Committee made a very careful scrutiny of the calamitous effects of disease and strongly recommended fundamental and radical statutory means of disease control. In 1938 the same Committee drew attention to the widespread incidence of pullorum disease in spite of the availability of an entirely satisfactory method of control. During the 1930's one-third of all batches of chicks received for diagnosis at Weybridge was found infected with *Salmonella pullorum*, an unhappy indication of the widespread distribution of the disease. This high incidence serves to explain why attention was directed primarily towards this disease at that time.

Whilst not solely concerned with the control of pullorum infection to the exclusion of other poultry diseases, the main intent and endeavour of the Animal Health Division's contribution was directed towards the eradication of this scourge from flocks participating in the Scheme, and from 1938 onwards all blood testing was carried out at the Ministry's veterinary laboratories until the introduction of the rapid whole-blood plate method of testing in 1942. This test was at first carried out by veterinary officers of the Animal Health Division but was subsequently taken over by lay poultry

testers, originally appointed in 1945 for this work, and now known as technical assistants. In Scotland, before 1939, tube tests for *Salm. pullorum* infection and post-mortem examinations were carried out at the Royal (Dick) Veterinary College at Edinburgh, samples being taken by the county poultry staff of the three agricultural colleges. Since then the laboratory work has been done at Lasswade and the blood testing, which since 1948 has been by the rapid whole-blood plate test, is now carried out, as in England, by technical assistants.

In the last twenty years the incidence of infected flocks in England and Wales has fallen from approximately 30 per cent in 1943 to 4 per cent in 1963. Even more significant has been the fall in the percentage of fowls reacting to the test—from 1.04 per cent in 1943 to 0.06 per cent in 1963 (six in every 10,000 birds tested). A similar result has been seen in Scotland where, in 1947, 23 per cent of flocks were infected and in 1963, 3.88 per cent, with a fall in the percentage of infected birds from 0.47 to 0.05 per cent. During the same period the incidence of infection among batches of chicks derived from a wide variety of flocks has also fallen steeply. In birds from England and Wales it has dropped from 21.4 per cent of 903 batches examined to 2.14 per cent of 2,337 batches, and in Scotland from 24.7 per cent of 315 batches to 1.5 per cent of 2,371. This achievement is all the more impressive because during the period under test the number of fowls has increased more than ten-fold.

The number of non-accredited breeding flocks supplying eggs to hatcheries or day-old chicks for sale is now relatively small, and it is estimated that approximately 70 per cent of hatchery-produced chicks are derived from accredited sources. In later years the number of flocks participating has declined but the poultry population of individual holdings in the scheme has increased and in 1961 a peak total of over 6.5 million fowls was tested. Although the steady decline in the number of birds infected is gratifying, reactors are still found in 4 per cent of flocks, and there is some difficulty in clearing certain flocks of infection, even with repeated blood tests. There may be obvious reasons for this, as, for example, overstocking of farms of small acreage with inadequate cleansing and disinfection of houses after removal of reactors, or the inability to move flocks to clean ground. A system of check testing such flocks was introduced in 1954. Following two clear routine re-tests, the entire flock is subjected to a check test some months later. This procedure has proved most effective in eradicating latent disease and in avoiding subsequent breakdown. It also affords greater protection to the hatcheries.

An unexpected difficulty in eradication arose from the appearance of a variant strain of *Salm. pullorum*. Originally six strains of the organism had been used in the preparation of broth antigen employed in the serum tube test from 1938 to 1941. The same six strains were used in the preparation of the stained antigen used for the rapid whole-blood plate agglutination test. These were later replaced by a single strain selected for its

good antigenic qualities. All strains used in producing the antigen for the tube and rapid tests had the same antigenic structure as the standard strain of *Salm. pullorum*. In the late 1950's, however, a variant strain was isolated with increasing frequency from clinical cases of pullorum disease and from reactors to the test, and birds infected with it sometimes gave inconclusive or even negative reactions when using standard antigen. As a result, a polyvalent antigen, which included both standard and variant strains, was prepared, tested and issued for field use in 1961.

The use of *Salm. pullorum* antigen detects not only fowls infected with pullorum disease but also those infected with fowl typhoid. This disease had been confined to localities in Great Britain but in the late 1940's and early 50's was causing alarming mortality outside its usual recognised endemic areas of Wales and north-west Scotland. Indeed, by 1947, fowl typhoid had become so serious on the Isle of Lewis in the Outer Hebrides, with deaths amounting to 50 per cent in some townships, that arrangements were made to provide a diagnostic service and to carry out agglutination tests and a vaccination programme. This scheme met with only a moderate response and by the winter of 1950 the position was so bad that a request was submitted to the Department of Agriculture for Scotland by the Lewis and Harris Agricultural Advisory Committee for the disease to be made notifiable. The request was rejected and the disease virtually disappeared soon afterwards, being confirmed in only one fowl in 1953, and on two from the same premises in 1954 and again in 1956. Since that date *Salm. gallinarum* has not been isolated on the island. The reasons for this remarkable phenomenon are not clear but it is possible that the slaughter of fowls and disinfection of the premises following a succession of outbreaks of fowl pest, sixteen in all, in Lewis around that time must have removed some possible foci of infection. This depopulation was followed by the import of fresh stock from the mainland and, to an extent, the adoption of more modern methods of poultry-keeping. Whatever the reasons, fowl typhoid ceased to be a problem in the islands. Over the country as a whole, control and eradication of fowl typhoid are generally assured in registered flocks by the routine plate test procedures, and a live vaccine has been developed for use in non-accredited flocks.

The other salmonellae, although not as yet amenable to eradication by blood test techniques, are controlled by hygiene and medication. Emphasis is laid on the fumigation of eggs and routine hygienic procedures in hatcheries. On the farm the importance of frequent collection of eggs from nest boxes is stressed, and the prophylactic use of furazolidone is common. The overall result is that the crippling loss from egg-borne salmonellosis and hatchery-transmitted infections has been avoided. It might well have checked post-war expansion of the industry.

Following reports of infectious disease or heavy mortality (a basic responsibility for owners within the schemes) diagnostic enquiries are arranged by the divisional veterinary officer in conjunction with the laboratory services. Temporary restrictions on the

sale or supply of hatching eggs or poultry may follow in order to prevent spread of disease.

The free diagnostic service offered by the Ministry's veterinary laboratories to owners in the schemes has been of great assistance not only in reference to routine disease enquiries but in the detection of newly emerging diseases in the national flock. The field and laboratory services, the blood-testing programme, and the selective and flexible use of restrictive measures, have together greatly assisted disease control not only within the schemes but throughout the industry as a whole.

In recent years the altered structure of the industry, with its tendency to integration at all levels, has developed to the point at which government-sponsored stock improvement schemes have become redundant, and the responsibility for future development is to be returned to the industry itself—with one important exception. The necessity for disease control remains. To this end a new poultry health scheme, to be established and administered by the Animal Health Division, is at an advanced stage of planning and may well be in operation before this book is published.

LICENSING OF BULLS AND BOARS

One of the methods of livestock improvement in Great Britain is the licensing of bulls and boars so that only a reasonably high standard of sire is available.

The licensing of bulls and boars is a function of the Livestock Improvement Branch of the Meat and Livestock Division of the Ministry in England and Wales; in Scotland it is the responsibility of the Livestock Improvement Branch of the Department of Agriculture and Fisheries.

The number of bull licence applications is being steadily reduced each year owing to the increased demand for artificial insemination. In England and Wales there were 12,793 applications in 1963 compared with 21,367 in 1957. In Scotland about 5,000 bull licences are issued annually, but artificial insemination is used much less widely.

Occasionally the advice of the Animal Health Division is sought but any veterinary examinations are normally made by private veterinary surgeons. The final recommendations, however, are given by the Animal Health Division. In bulls the main veterinary reasons for recommending the refusal of a licence are jaw abnormalities or defective genital organs, and the latter is the main cause of rejection of boars.

The grounds for the refusal of a licence for both bulls and boars are defined in Section (2) of the Improvement of Livestock (Licensing of Bulls) Act 1931 and fall into three categories: firstly, defective or inferior conformation, likely to beget defective or inferior progeny; secondly, permanently affected with any contagious or infectious disease; and thirdly, permanently affected with any other disease rendering the animal unsuitable for breeding purposes.

LICENSING OF STALLIONS

Under the Horse Breeding Act of 1958 it is, with certain exceptions, an offence to keep a stallion over the age of two years without a licence or permit; a horse being regarded as one year old on the first day of January in the year following that in which it was foaled, and two years old on the same day of the following year.

Licences are not required for thoroughbreds, Shetland ponies, certain prescribed breeds of mountain and moorland ponies, and stallions foaled before 1945.

Veterinary surgeons in practice are selected from a panel to carry out the inspections on which licences are based and occasionally the Animal Health Division is consulted.

ARTIFICIAL INSEMINATION IN ANIMALS

ARTIFICIAL INSEMINATION in animals has been practised in Great Britain for over twenty years. In 1942 the Agricultural Improvement Council set up a supervisory committee, under the chairmanship of C. Neville,

to supervise the conduct of certain projected schemes of AI, to advise the Council as to their progress and as to the desirability of extending the scope of the work, and to make recommendations to the Council as to the need for any control of the practice of AI and as to measures whereby this can be effected.

Two centres were set up, one at Cambridge, which commenced operations in November 1942, and one at Reading which opened in February 1943. The Committee observed their activities and in December 1943 made an interim recommendation to the Agricultural Improvement Council expressing, *inter alia*, its satisfaction that

under ordinary farming conditions a much larger number of cows can be inseminated by the same bull artificially than by natural means, and that, with proper precautions, the risk of the spread of disease communicable by the bull is wholly or largely eliminated, while results already obtained show that cows hold to service at least as readily and that the resultant calves are also satisfactory.

The Committee also stated that

on the basis of results achieved so far, the Supervisory Committee recommends that some encouragement might well be given, through the medium of the Ministry's Livestock Improvement Scheme, or otherwise, to the establishment of a limited number of AI centres, particularly in districts where there is a concentration of small dairy herds and the potentialities of livestock improvement are greatest. The Supervisory Committee attaches some importance to the non-profit co-operative principle, and would like the Ministry to consider whether development should not be confined to producers' organisations such as the Milk Marketing Board, Breed Societies and co-operative bodies of producers.

Arising from the Supervisory Committee's interim recommendations, and from consideration of a particularly valuable and comprehensive report submitted to the Council in January 1944 by Dr J. Edwards of the School of Agriculture, Cambridge and J. N. Ritchie of the Ministry, following a visit they made to America to obtain first-hand information on the position of AI in the United States, the Departmental Committee on Artificial Insemination was appointed with Sir Donald Vandepier as its chairman. The Committee summarised its recommendations in a report issued in May 1944, suggesting that artificial insemination centres should be controlled and developed as a national service on behalf of the livestock industry; that licences for such centres should be granted only to organisations controlled and financed by producers such as the Milk Marketing Board, farmers' co-operative societies and the cattle breed societies; that, subject to suitable safeguards, the State should underwrite up to a specified amount any losses incurred by the Milk Marketing Board during an initial period of five years, and that an advisory committee should be appointed for the purpose of advising the Minister generally on the economic aspect of the control and development of centres.

The Report was accepted and the Central Advisory Committee on Artificial Insemination in England and Wales, with the Duke of Norfolk as chairman, was appointed. This was followed later by the formation of a Supervisory Committee on Artificial Insemination in Scotland.

Local advisory committees provide a liaison between the farmers using the AI service and the centre itself, and help in the selection of the bulls and in the development of breeding policy.

In addition to the introduction in 1943 of necessary control regulations, in order that the livestock industry and the community should achieve maximum benefit from artificial insemination the Ministry took active steps to encourage the development of the practice when, in 1946, legislation was introduced in England and Wales to empower the Minister to underwrite financial losses in AI development up to the year 1950. This was subject to certain restrictions on the purchase price of bulls and on technical and administrative measures being supervised by the appropriate department of the Ministry. The financial assistance guaranteed by the Government hastened development and resulted in rapid extension of AI facilities, with the building of centres and sub-centres, to almost the whole of England and Wales. Similar facilities in Scotland followed later.

In the year ending 31 March 1964 a total of 2,136,000 first inseminations were carried out in England and Wales and 120,000 in Scotland. It is estimated that just over 60 per cent of all calves born in England and Wales are got by AI. The percentage in Scotland is lower.

The possibility of international trade in semen was foreshadowed in 1943 when

statutory control over its import and export was laid down in the Agriculture (Miscellaneous Provisions) Act 1943. Section 17 of the Act enables the Minister and the Secretary of State for Scotland to make regulations to control the practice of artificial insemination and the distribution and sale of semen. The regulations which are at present invoked for this purpose are the Artificial Insemination of Cattle (England and Wales) Regulations 1957; the Artificial Insemination of Pigs (England and Wales) Regulations 1964, and their equivalent Regulations for Scotland. Section 17 also prohibits the export or import of semen of cattle, sheep, goats, swine, horses, domestic fowls, turkeys, geese and ducks except under licence.

A committee with Lord Oaksey as chairman was appointed in 1949 to examine the problems of import and export of semen. Reporting in 1952 it concluded that it would be contrary to the national interest and to the interests of the breed societies to hold aloof from this developing business even if it should mean a decline in the number of live bulls exported.

Exports of individual consignments of semen are licensed after conferring with the breed societies, and provision is made for export of semen from bulls standing at specially authorised premises where there are comparable health measures to those observed in the AI centres.

Under the Diseases of Animals Act 1950, the Importation of Animal Semen Order 1955 was made prohibiting, except under licence, the landing of semen of canine animals, feline animals, swine, sheep, goats and all other ruminating animals except cattle, domestic fowls, turkeys, geese, ducks, guinea-fowls, pigeons, pheasants and partridges. This Order was subsequently amended by the Importation of Animal Semen (Amendment) Order of 1964 which added horses to the list of animals to which prohibition applies. It excludes swine because of the introduction of the Insemination Regulations for Pigs made in 1964. Imports, it will be obvious, are not allowed except for very special purposes, and imports from countries where virus diseases are endemic are completely prohibited; indeed this was a recommendation of the Oaksey Committee.

The task of administering the artificial insemination regulations falls within the province of Livestock Improvement Branch, and the Animal Health Division is only concerned administratively with export and import; its functions are to provide the veterinary service for other aspects.

Veterinary officers of the Animal Health Division who have undergone special courses of instruction at Weybridge carry out stipulated examinations and tests of the health of selected bulls, and have examined 8,500 bulls between 1943 and 1963. They report on any anatomical abnormality or defect which might be transmitted to the bull's progeny and investigate the breeding history of the bulls and of the herds of origin with special reference to vibriosis infection and to fertility levels. Veterinary

officers undertake routine health examinations and tests, normally at six-monthly intervals, of all animals standing in centres. They examine and report on the suitability of any proposed centre and its facilities. They also conduct examinations and report on the technical staff employed in centres. At the end of their probationary period staff are examined for technical ability and such knowledge of anatomy and physiology as it is considered necessary for them to know in the performance of their duties.

Senior veterinary officers, with senior officers of Livestock Branch, make regular quarterly inspections covering all aspects relating to the proper running of the centres.

Results of an enquiry made through the Ministry's divisional veterinary officers in 1942 regarding the incidence of trichomoniasis indicated that the disease, having been suspected or diagnosed clinically in thirty-two counties in England, seven in Wales and seven in Scotland, was much more widespread than had been believed. The north Wales area was particularly heavily infected. To combat the infection the Ministry set up an AI centre in Ruthin which began operations in November 1943. The results were eminently satisfactory and provided a salutary example of the value of AI in dealing with an infectious venereal condition. The Ruthin centre was taken over by the Milk Marketing Board in January 1960. Following the Ruthin work the general increase in AI facilities led to a steady decrease in the incidence of trichomoniasis and within a decade the disease had virtually disappeared from the country.

The only centre now operated by the Ministry is at Reading where research into various aspects of artificial insemination is done in addition to supplying commercial AI facilities. Included in the subjects studied are methods of evaluation, dilution and storage, including deep-freezing of semen, the effect of the addition of antibiotics to semen diluents on the conception rate, and the bacteriology of semen.

Extensive research into vibriosis had been initiated at Weybridge in 1951. Studies of the disease at the Ruthin and Reading AI Centres in 1955 increased considerably the understanding of its epidemiology. At Reading 25 per cent and at Ruthin nearly all the bulls were found to be infected. They were treated with antibiotics and later tests confirmed that this was effective. The infection rates of the bulls in these two centres was surprisingly high in view of the care which had been taken in 'screening' bulls prior to entry but it seems likely that foci of infection had been introduced during the earlier years when the disease was virtually unknown and unrecognised. A fuller account of the work of the Division in respect of vibriosis and trichomoniasis is given in the section on bovine infertility.

There was no reason to suppose that the infection rates in other centres in the country were different so, in 1956-57, either large-scale treatment of all artificial insemination centre bulls, or test-mating with treatment of those bulls found to be infected, was instituted. These measures led to a dramatic fall in the number of complaints made

regarding artificial insemination and to an average increase of 9.2 per cent in the artificial insemination conception rates in the national herd.

ARTIFICIAL INSEMINATION IN PIGS

A commercial service of artificial insemination has been offered to pig-breeders by a few independent artificial insemination organisations since 1955 and, since 1958, by the Ministry's Centre at Reading where research work is in progress. Technical difficulties, mainly in regard to the storage of boar semen and the timing of insemination, have hindered development of the practice. However, at the end of 1964 the Artificial Insemination of Pigs (England and Wales) Regulations, together with the equivalent Scottish Regulations, came into force. A few centres have been licensed to operate this service, including the Ministry's centre at Reading.

Development of the present pig artificial insemination service, which is being subsidised by the Pig Industry Development Authority, will depend on the improved techniques that should result from the present research at Reading and elsewhere and on the extent to which it is utilised by the pig-breeder.

ARTIFICIAL INSEMINATION IN TURKEYS

In turkeys the commercial development of broad-breasted strains of Bronze and White types makes the use of artificial insemination essential as a breeding technique. Various aspects of artificial insemination in turkeys, particularly in regard to the use of diluents and diluted semen, are being studied at Weybridge.

Chapter 4

Animal Welfare

DURING the eighteenth century very little interest would appear to have been taken by the general public in the welfare of animals or in the preservation of British wild life. Until well into the nineteenth century bull-fights, dog-fights, cock-fights, sparrow battues and the baiting of badgers and bears were still being organised in some localities as forms of entertainment. The overworking and overdriving of unfit or lame horses was far from uncommon and even as late as 1870 it is recorded that of 100 horses observed in Hyde Park 30 were lame, while of 607 observed working in the streets of Edinburgh 171 were unfit for the same reason.

Domestic pets received little more consideration. About 1850 in London, with a population of under four million, it has been recorded that there were some 20,000 street traders who dealt in live animals and birds; that over 40,000 English wild birds were sold annually by those traders, and that, in addition, over 200,000 dead larks were delivered each year direct to Leadenhall market for the tables of the wealthy.

By the beginning of the nineteenth century, nevertheless, indignation at the treatment of animals and birds had been aroused and by 1824 the public demand that action must be taken resulted in the founding of the first animal welfare society in Great Britain—the Royal Society for the Prevention of Cruelty to Animals. This Society covered England and Wales and was followed in 1839 by a very similar Society in Scotland—the Scottish Society for the Prevention of Cruelty to Animals.

The two societies established a supervisory inspectorate and, besides rendering what practical services they could for the alleviation of suffering, exerted their energies and influence to the education of the general public in a concern for all forms of animal life and to the promotion of legislation for the welfare of animals.

With the passing of time many other societies have been formed: some are interested in prevention of cruelty to animals generally, some in specific animals, some in the preservation of wild bird life, and some are concerned with the abolition of certain practices. In addition, many homes for stray cats and dogs and rest homes for aged horses have been established.

Public interest, once aroused, has grown and intensified throughout the years and

has resulted in the enactment of a huge volume of legislation which has from time to time been expanded and amended to take account of changing fashion and practice in national, agricultural and commercial life.

Animal welfare legislation can be roughly divided into two main sections: one designed to protect domestic animals and wild animals in captivity; the other to protect or preserve free-living wild animals and birds. There are also quite a number of Orders made by the Minister of Agriculture, Fisheries and Food, under powers contained in the various Diseases of Animals Acts, which are designed to protect animals during transit from unnecessary suffering.

PROTECTION OF DOMESTIC ANIMALS AND WILD ANIMALS IN CAPTIVITY

Without dealing in detail with all the Acts and amendments involved, it is possible from a brief review of the more important to get an impression of the very extensive and detailed character of animal welfare legislation and of how, albeit often due to public demand, it has built up during the last hundred years or so.

The first piece of legislation which impinged on animal welfare would appear to be The Knackers Act of 1786. This was not introduced as a welfare measure but was designed to control the large-scale stealing of animals, with subsequent sale to knackers, which was then prevalent. The Act required every person carrying on the business of a knackery to be licensed by the local authority and to keep proper records. It also required the local authority to appoint inspectors to supervise such premises. This Act was amended by The Knackers Act 1844, which, in addition to other requirements, made it an offence to beat, ill-treat or abuse any animal within the knackery, gave power of entry to constables, and is peculiar in that it provides a penalty for local authority inspectors who fail to carry out their duties in a proper fashion.

The first official measure for animal protection came into being in 1822. In the previous year Richard Martin, MP, one of the persons chiefly responsible for the formation of the RSPCA, had unsuccessfully introduced a Bill for the prevention of cruelty to animals, but in 1822 succeeded in having the Cruel Treatment of Cattle Act passed. This was a very modified measure; it did not cover pigs, dogs or birds and merely made it an offence cruelly to beat, abuse, or ill-treat cattle and sheep.

This Act was replaced by the Cruelty to Animals Act 1835 which was much more comprehensive and applied to all domestic animals and other animals in captivity. It made it an offence to beat, abuse, overdrive or torture or to fail to provide any confined animal with food and water. It also extended to the whole country the provisions of the Metropolitan Police Act 1834 prohibiting the keeping of a place for the baiting or fighting of bulls, dogs, badgers, bears, cocks or any other kind of animal whether domestic or wild. In order to prevent worn-out horses being worked or sold by knackers it required all knackers to slaughter within three days all horses delivered to them.

Because of continued agitation by the two welfare societies this Act was replaced by the Protection of Animals Act 1849 which applied to England and Wales. Besides including all the provisions of the 1835 Act it made it an offence improperly to convey an animal so as to cause unnecessary suffering, and prohibited a knacker from being a horse dealer and debarred him from permitting any animal delivered to him to be sold, used, or leave his premises alive. A somewhat similar Act covering Scotland came into operation in 1850.

In the years which followed, various extensions were made to this Act: the Cruelty to Animals Act 1854 extended to the whole country a provision made in 1837 prohibiting the use of dogs in the Metropolitan Police District for the purpose of draught; the Poisoned Grain Prohibition Act 1863 and the Poisoned Flesh Prohibition Act 1864 prohibited, except in certain circumstances, the laying of poisoned grain or food in open places to which animals had access; the Drugging of Animals Act 1876 restricted the administration of poisonous drugs to animals; the Wild Animals in Captivity Protection Act 1900 and a similar Scottish Act of 1909 extended the Cruelty to Animals Acts 1849 and 1854 to cover bird, beast, fish or reptile; the Cruelty to Animals (Scotland) Act 1895 extended the 1850 Act to include game or fighting cock or other domestic fowl or bird, and the Injured Animals Act 1907 empowered a police constable to destroy without the owner's consent any animal so diseased or injured that it could not be moved without cruelty, if so certified by a veterinary surgeon.

All these Acts were embodied and amplified in the Protection of Animals Act 1911 and the Protection of Animals (Scotland) Act 1912. These two principal Acts are still in operation and, with slight amendments made in 1912, 1921, 1927 and 1948, contain the general powers under which action can be taken for the prevention of unnecessary suffering to domestic animals and wild animals in captivity. Certain Acts have since been passed elaborating the general principles laid down in the two main Acts, but before considering these it may be of interest to look at some additional and rather specialised aspects of protection of animals.

Until the close of the eighteenth century all human medical and surgical treatment was based purely on medical theory. During the latter half of the century, however, a number of eminent surgeons began to test those theories against fact, mainly by experimentation on living animals. Prominent in this group was the famous surgeon-anatomist John Hunter and some of his immediate colleagues. Arising out of their researches Hunter's nephew Matthew Baillie published in 1793 the first English textbook on pathology, and exposed the fallacy of many of the accepted medical theories.

From this time onwards, experimentation on living animals was intensified and, because the use of chloroform was not discovered until 1847, the amount of pain inflicted must have been considerable. It is therefore not surprising that the Cruelty to Animals Act 1876 was brought into force, making it an offence to perform on a living

animal any experiment calculated to give pain, except on satisfying a number of very rigid restrictions: for example, the person performing the operation must be licensed by the Secretary of State¹ and must show that the experiment is with a view to advancement of new discovery of physiological knowledge or knowledge which will be useful in saving or prolonging life or alleviating suffering. Moreover, the animal must be kept under an adequate anaesthetic during the whole of the operation and, except where the Secretary of State has granted permission to keep the animal alive, must be slaughtered before recovering from the effect of the anaesthetic if it is likely to suffer pain. This Act has never been amended and is still in operation, but a committee was appointed in 1963, with Sir Sydney Littlewood as chairman, to examine and report on all aspects of vivisection.

The working conditions, general care and treatment of pit ponies and horses during the early nineteenth century gave rise to considerable anxiety and adverse comment. In order to safeguard pit ponies, Coal Mine Regulations were introduced in 1887 which provided for their general welfare and for the submission of reports by inspectors appointed by the Secretary of State on the condition and general health of all horses and other animals employed at mines. The regulations also prohibited the use of horses in any underground road which was too narrow for a horse to work in comfort.

These regulations were replaced in the Coal Mines Act 1911 by very detailed conditions governing the use of horses in mines. Amongst other things the horses have to be over four years of age, have passed the mallein test, be suitably housed in ventilated stables, must not be blind, and must be provided with well-fitting harness including a guard for the eyes. The Act also requires the appointment of recognised horse-keepers who are responsible for the carrying out of frequent inspection of horses for signs of abuse and the keeping of detailed daily records of each horse.

With the mechanisation of the mines the use of horses has almost ceased. Whereas 5,744 ponies were used underground in Scottish mines in 1913, the number had dropped to 464 in 1943 and to fifteen in 1963.

Dogs have been the subject of a number of welfare Acts. Usually these have a dual purpose and provide safeguards both for the dog and for the owner and general public. The Dogs Act 1871 gives powers to seize and destroy stray or savage dogs but prescribes a period during which the dog must be held before destruction. The 1906 Act prescribes the wearing of identification collars by dogs, prohibits straying and fixes liability on the owner for damage done by his dog to other livestock. It also prohibits the selling of stray dogs for vivisection and requires any person finding a stray dog to notify the police. There were slight amendments to this Act in 1928, 1938 and 1948. In the Protection of Animals (Cruelty to Dogs) Act 1933 power is given to

¹ The Secretary of State for the Home Department (the Home Secretary) for England and Wales, and the Secretary of State for Scotland. Several Ministries and many outside bodies are concerned with the problems of animal welfare.

the court to order persons convicted under the 1911 Act of cruelty to a dog to be disqualified from keeping one. A similar Act, passed in 1934, refers to Scotland. The Dogs (Amendment) Act 1938 confers the right of appeal to the Quarter Session against a court order for the destruction of a dog, while the Dogs (Protection of Livestock) Act 1953 provides for the punishment of persons whose dogs worry livestock on agricultural land.

The passing of the Animals (Anaesthetics) Act in 1919 was of very considerable importance in the protection of domestic animals. It detailed the operations which must be carried out under (a) a general, and (b) a general or local anaesthetic.

This Act was revoked by the Protection of Animals (Anaesthetics) Act 1954 which stated that if any operation be performed on an animal without the use of an anaesthetic so administered as to prevent any pain during the operation then that operation should be deemed, for the purpose of the 1911 and 1912 Acts, to be an operation performed without due care and humanity. Exemption was given in the case of certain stated minor operations.

A subsequent amendment Act, the Protection of Animals (Anaesthetics) Act 1964, reduced the scope of permitted minor operations without anaesthetic still further by making it obligatory to use an anaesthetic when castrating dogs, cats, horses, asses and mules of any age, goats and pigs over two months of age, and calves and lambs over three months old, or when de-horning cattle and disbudding calves, except in specified circumstances; and it forbids the use of rubber rings in castration in animals over one month old.

The Veterinary Surgeons Act 1948 also provides considerable protection in this connection. It limits the persons who may carry out all but very minor operations to those registered by the Royal College of Veterinary Surgeons, and details the ages over which animals can be castrated only by persons so registered.

The slaughter of animals has over the years been the subject of much consideration. The principal Acts of 1911-12 require that animals shall be slaughtered with as little suffering as possible and not in the sight of other animals. In addition to this, local regulations made under Public Health and Burgh Police Acts had been in operation in most slaughterhouses from about 1892.

In 1928 the Slaughter of Animals (Scotland) Act came into force. This requires every animal, except swine, slaughtered in a slaughterhouse or knacker's yard to be instantaneously slaughtered or, by stunning by means of a mechanically operated instrument, to be rendered insensible to pain until death supervenes. It also requires slaughtermen to be over eighteen years of age and licensed. Exemption is given for meat slaughtered for food for Jews and Mohammedans. This Act was extended in 1949 to include swine.

In 1933 a Slaughter of Animals Act applicable to England and Wales was passed.

This had the same requirements as the Scottish Act but included swine and recognised stunning by electricity. It also had additional requirements such as slaughterhouse floor structure and fixing of animals' heads. There was a slight amendment to it in 1951 affecting horses.

By the Slaughter of Animals (Pigs) Act 1953 the slaughter of pigs exceeding twelve weeks of age is prohibited in any place other than a slaughterhouse or knacker's yard except by a mechanically operated instrument. This Act also extended to Scotland the recognition of stunning by electricity.

Within recent years cruelty regulations applicable to slaughterhouses have also been brought into force, and are embodied in the Slaughter of Animals (Prevention of Cruelty) Regulations 1958.

Generally speaking, protection was afforded to animals in markets under the main protection Acts but no specific provision for protection of animals whilst exposed for sale or awaiting removal after exposure for sale existed before 1963. To close this gap in the legislation a section (14) was included in the Agriculture (Miscellaneous Provisions) Act 1953 amending the Diseases of Animals Act 1950 to empower the Minister to make Orders to prevent any such unnecessary suffering.

The Markets (Protection of Animals) Order 1964 followed in July of that year. Under this Order veterinary inspectors are given wide powers to treat, protect and, if necessary, remove suffering or unfit animals from markets: requirements are laid down for feeding, watering, penning and housing; and calves, dairy cows and pigs must be given prior claim on available covered accommodation. Further legislation is being considered which will require such animals to be kept under cover and protected from draughts.

Since 1911 quite a number of Acts have been passed for the purpose of extending, clarifying or rendering more easily enforced the general requirements of the principal Acts. The most important of these are briefly summarised:

The Captive Birds Shooting (Protection) Act 1921 prohibits the promotion of any event at which captive birds are released for the purpose of being shot at the time of liberation.

The Performing Animals (Regulations) Act 1925 requires registration with the local authority of any person and premises engaged in exhibiting or training any performing animal. Power is given to the local authority to carry out inspections and to the courts to cancel registration on conviction for cruelty.

The Protection of Animals Act 1934 prohibits the holding of any public performance which includes throwing or casting with ropes or other appliances any unbroken horse or untrained bull, or of riding or attempting to ride any horse or bull which has been stimulated with the intention of making it buck during the performance.

The Cinematograph Films (Animals) Act 1937 prohibits the exhibition to the public,

whether for payment or not, of any film, if, in connection with the production, any scene was organised or directed in such a way as to involve pain or terror, or the cruel goading of any animal.

The Riding Establishments Act 1939, which confers powers on the local authority to appoint veterinary surgeons for the purpose of inspecting premises kept as riding establishments and the horses used in such premises, makes it an offence to let out on hire or use for giving instruction in riding any unfit horse or to keep any horse in a neglected condition.

The Docking and Nicking of Horses Act 1949 prohibits the docking or nicking of horses' tails and, with certain exceptions, the landing in this country of a docked horse.

The Pet Animals Act 1951 requires all pet shops to be licensed by the local authority which must, before issue of a licence, be satisfied as to the suitability of the premises regarding size, temperature, lighting, ventilation, cleanliness and fire prevention. This Act prohibits sale of pets in the streets or to children under twelve years of age and requires that pets should be provided with adequate food and water and be regularly attended.

The Cockfighting Act 1952 makes it unlawful to be in possession of any instrument or appliance designed or adapted for use in connection with fighting of any domestic fowl.

The Protection of Animals (Amendment) Act 1954 empowers the courts on a second conviction for cruelty under the principal Acts to disqualify such a person from having custody of any animal for such period as the court may decide, and increases in such cases the penalty which can be imposed under the Dogs Acts 1933 and 1934.

The Abandonment of Animals Act 1960 makes it an offence under the principal Acts to abandon an animal, whether permanently or not, in circumstances likely to cause unnecessary suffering.

The Animals (Cruel Poisons) Act 1962 extends the principal Acts by conferring powers on the Secretary of State under which he may restrict the use of certain poisons.

The Animals Boarding Establishments Act 1963 requires the owners of such premises to be licensed by the local authority and the premises to be suitable in respect of such matters as size, lighting, ventilation, heating, cleanliness and exercising facilities.

FREE-LIVING WILD ANIMALS AND BIRDS

There is no general legal protection comparable to the Protection of Animals Act 1911 covering free-living wild animals.

In the absence of general protection a good deal of indirect protection has undoubtedly been provided by various Acts in so far as these limit or prohibit the laying of spring traps. The Ground Game Act of 1880, for example, limited the use of spring

traps for the taking of rabbits, to those set in rabbit holes, while the Protection of Animals Acts 1911-12 required all spring traps to be inspected once daily during daylight. The Prevention of Damage by Rabbits Act 1939 authorised the use of gas for the humane destruction of rabbits and further protection was provided by the Agriculture Act 1947 and the comparable Scottish Act of 1948, the Pests Act 1954 and various Orders of 1958 made under those Acts. All spring traps must now be of approved patterns.

Arising out of the introduction of two Private Members' Bills in the 1948-49 Session, aimed at the prohibition of hunting, the Committee on Cruelty to Wild Animals with J. Scott Henderson, KC, as Chairman, was appointed in 1949. The Committee produced a very comprehensive and detailed report in 1951 covering the natural history, habits and methods of control of each of the British wild mammals. It roundly condemned the use of the gin trap, described by the Committee as 'a diabolical instrument which causes incalculable suffering'. Protracted research and field trials followed to find humane and efficient alternative traps. This was not a problem easily solved, and some years were to pass before suitable traps could be designed and tested. However, legislation was provided by the Pests Act 1954 and, since 1958, the laying of the gin trap has been prohibited in England and is only allowed in Scotland for taking foxes.

In so far as deer are concerned, in England and Wales the Deer Act of 1963 prescribes closed seasons for various types of deer and makes it an offence to take them during such seasons. It also prohibits the setting of traps or snares, the use of poisoned or stupefying bait and the use of certain classes of firearms and ammunition. In Scotland the Agriculture Act 1948 prescribes a closed season for certain classes of deer.

The decimation of British wild birds has long given cause for concern and much legislation has been enacted in attempts at their preservation. Between 1772 and 1860 a number of Game Acts were brought into force providing a closed period during which the shooting or taking of certain game birds was prohibited. This form of protection was extended to wild birds generally by the Wild Fowls Protection Acts of 1872 and 1876 which were consolidated in the Wild Birds Protection Act 1880. This Act was quite comprehensive in that it prohibited the shooting, or taking by any means whatever, of any wild bird between the beginning of March and the beginning of August in any year. It also provided a schedule of specified birds which were further protected by special penalty. While exemption was given to the occupier of land in respect of operations on his own land this exemption did not extend to the scheduled birds. Power was given to the Secretary of State to alter or extend the closed period.

This Act was slightly amended in 1881 and again in 1894 when the Secretary of State was given power to make Orders, on application by local authorities, to prohibit

the taking of eggs or nests of wild birds during specified periods. A further amendment in 1896 authorised the Secretary of State to extend the 1880 Act to cover other classes of birds and other periods. Most local authorities used those powers to have Orders made and approved.

Quite a number of amending Acts were subsequently made, mainly concerned with making additions to the scheduled classes of birds.

Further protection was provided by the Wild Bird Protection Acts of 1904 and 1908 which prohibited the fixing or placing of spring traps and the use of hooks or similar appliances for the taking of birds. The Protection of Birds Act 1925, besides prohibiting the use of tethered live birds, injured or blind birds as decoys, debarred the use of bird lime or substances of a like nature for the purpose of capturing alive any wild bird, and it also prescribed a minimum space requirement for cages. The Protection of Birds Act 1933 prohibited the taking of any scheduled wild bird resident in or visiting Great Britain for the purpose of selling it alive. The Wild Birds (Duck and Geese) Protection Act 1939 prohibited the importation of dead wild duck and geese during the closed period, and the Quail Protection Act 1937 prohibited the importation of the common quail during the closed period.

All those Acts have now been consolidated in the Protection of Birds Act 1954 as amended in 1961. This details those wild birds and their eggs which are protected at all times by special penalty; those which are so protected during a closed season; those which may be killed or taken by duly authorised persons for special purposes; those which may be killed or taken by any person outside the closed season, and those which may not be sold alive unless close ringed and bred in captivity. The importation of certain wild birds or their eggs is prohibited, as is the use of certain methods of taking. This Act also provides power for the establishment of bird sanctuaries and for the setting up of advisory committees on the protection of wild birds.

PROTECTION OF ANIMALS DURING TRANSIT

The legislation designed to protect animals during transit is contained in Diseases of Animals Acts and Orders made by the Minister of Agriculture, Fisheries and Food. It has been designed to ensure that only fit animals are conveyed; that during loading and unloading, and throughout the entire journey there will be the minimum risk of the animal being subject to accident, unnecessary suffering or undue exposure or discomfort, and that means will be readily available to deal with an emergency.

In addition, legislation has been enacted to prevent, so far as is possible, animals which have been sold abroad for slaughter for human consumption being subjected to unnecessary suffering after they have left the jurisdiction of this country.

The legislation has been built up during the years to take account of added experience, increase in volume of trade and changing commercial needs and practices.

Generally, horses are dealt with separately from other animals, as is transit by sea, air, rail and road.

It is not possible to deal with all the Orders and Amendments in detail, but a brief review of the more outstanding may give an idea of the comprehensive cover which has now been given.

The earliest mention of prevention of cruelty during transit was in the Cruelty Act of 1849 which provided a penalty for improperly conveying any animals. By 1869 it had become apparent that general movement of animals required further investigation. A departmental committee was set up to consider the best means of regulating animal movement. It reported in 1870 and later that year the first Transit Order was made. This required, amongst other things, the division into pens of the space on ships where animals were carried and it imposed certain requirements in the carriage of animals by rail. The Order covered cattle, sheep, all ruminating animals and swine.

The Transit of Animals (Water) Order 1871 detailed the railway stations at which railway companies were required to provide water for animals. A travelling inspector was appointed in 1874 to supervise the working of this Order, and more were appointed the following year.

Complaints continued to be made, especially in connection with the Irish cattle trade, and a more comprehensive Order, the Animals (Transit and General) Order 1895, was passed. This dealt with transit by sea and rail, prescribing structural requirements necessary on ships and on cattle trains, and dealt with ventilation, additional protection necessary for shorn sheep, provision of food and water and employment of experienced cattle attendants during sea voyages.

A further Animals (Transit and General) Order was made in 1912 and with various amendments remained in force until in 1927 the Transit of Animals Order, at present in force, came into being. It covers cattle, sheep, all ruminating animals and swine on sea voyages between ports in Great Britain, and between ports in Great Britain and ports in Ireland, the Channel Islands and the Isle of Man. It also covers transit by rail and by hired road transport. Very detailed requirements are laid down as to structure, fittings, provision of ventilation and light, and precautions necessary in inclement weather and during loading and unloading, and it provides for all aspects of animal welfare.

The section of this Order covering transit by road was amended in 1930 and again by the Transit of Animals (Amendment) Order 1931. Other amendments were made in 1939 and 1947.

An equally comprehensive Order, the Animals (Sea Transport) Order 1930, covers sea transport of the same classes of animals between ports in Great Britain and ports beyond Ireland and the Channel Islands. Here, again, structure of the vessel, fittings, place and method of securing of animals, provision for inclement weather, carrying

of approved killing instruments and all other aspects of protection are dealt with in detail. There is also a provision requiring the employment of experienced animal attendants. There was a slight amendment to this Order in 1932.

The Animals (Landing from Channel Islands, Isle of Man, Northern Ireland and Republic of Ireland) Order 1955, which re-enacted a similar Order of 1933, provides a measure of relief for animals subsequent to the sea journey in that it requires all cattle, sheep, goats, all other ruminants and swine arriving in Great Britain to be rested in special landing places for a period of not less than ten hours.

Arising out of public complaint that cattle exported from this country to Europe, mainly for slaughter, were being subjected on arrival to further long journeys without adequate rest or the provision of food and water, there resulted the Exported Cattle Protection Order 1957 with an amending Order later in that year. These Orders required cattle being exported to any place in Europe, whether by sea or air, to be rested in approved premises for at least ten hours before loading and then to be inspected by a veterinary inspector who was given powers to prohibit the loading of any unfit animal. Furthermore, the export of cattle for slaughter was only permitted to countries in Europe giving an undertaking that such cattle will be slaughtered in slaughterhouses not more than 100 km. from ports of disembarkation (the so-called Balfour agreement).

Similar complaint was made in February 1964 in respect of sheep, exported to France for slaughter, being conveyed to Algeria for ritual slaughter under unsatisfactory conditions. The complaint was investigated and it was found, as is so often the case, to have been exaggerated; nevertheless it seemed reasonable at this time to take the opportunity to include sheep and swine within a protection Order. This was done by revoking the Exported Cattle Protection Order 1957 and its amending Order and replacing them by the Exported Animals Protection Order 1964 which came into force in June of that year, within three months of the public complaint. The Order included a new clause to prohibit carrying cattle, sheep or pigs when the owner of a vessel anticipates adverse weather conditions during the voyage.

The Transit of Calves Order 1963 was brought into being as a result of public complaint that young calves were being conveyed long distances under adverse conditions. The Order makes it an offence to permit an unfit calf to be carried in a road vehicle except when such a vehicle is being used as an ambulance. It also requires that calves when being so carried shall be offered suitable food and water at intervals of not more than eighteen hours and that the floors of floats shall be covered with adequate bedding.

The transit of poultry is covered by the Conveyance of Live Poultry Order of 1919 which details the conditions applicable to the welfare of poultry which must be observed during conveyance by sea, by rail, by road and at sales. It prohibits transit of

unfit poultry, the use of unsuitable receptacles, and of mixed consignments except where separate compartments are provided. The provisions of this Order in so far as sales are concerned are strengthened by the Poultry (Exposure for Sale) Order of 1937.

As air transport of animals became more fashionable it became necessary to cover this form of transit. The Agriculture (Miscellaneous Provisions) Act 1954 gave authority to extend to air travel the same provisions as apply to sea travel.

Towards the close of the nineteenth century public concern was expressed about the fate of worn-out and unfit horses which were being exported for slaughter, chiefly to Antwerp. It was alleged that many such horses were being sold for work and were being subjected to much cruelty. An Order prohibiting the exportation of unfit horses was made in 1898 and, in a further attempt to stop the export of old or unfit horses to Europe, the Diseases of Animals Act 1910 specified a number of ports from which export must be made and required that, with a few excepted classes, all horses being exported must be examined by a veterinary inspector and certified as being capable of being conveyed to their destination and disembarked without cruelty. The Exportation of Horses Act 1914 extended this certification to include the capacity to be worked without cruelty after disembarkation, while the Exportation of Horses Act 1937 limits the age of such horses to not more than eight years and also prescribes a minimum value. Amendments to the specified values are contained in the Exportation and Transit of Horses, Asses and Mules (Amendment) Order 1937 and the Exportation of Horses (Minimum Values) Order 1950 as amended in 1956.

The transport of horses was first covered in 1909 by a Conveyance of Horses Order, in 1913 by a still more comprehensive Horses (Importation and Transit) Order, and again in 1921.

The Exportation and Transit of Horses, Asses and Mules Order of 1921, at present in force, covers all the necessary requirements for the safety, welfare and general comfort of the horse during sea or rail journeys in the same detailed fashion as the corresponding Orders protect cattle. In so far as sea voyages were concerned the Order covered journeys from any port in Great Britain, or to any port in Great Britain from any port in the Channel Islands or the Isle of Man. This Order was amended to a certain extent by the Horses (Sea Transport) Order 1952 in that it now also covers the carriage of any horse by sea from or to any port in Great Britain, and alterations were also made to certain other requirements. Some further amendments were made in 1958.

The Transit of Horses Order 1951 contains the present regulations covering the structure of road vehicles carrying horses, the method of carrying, protection from weather and general requirements for the welfare of the horse. It also amends in certain respects previous legislation involving rail travel.

Additional protection for ponies is contained in the Exported Ponies Protection

Order 1958 which requires all ponies, with a few exceptions, to be examined by a veterinary inspector and to be certified as capable of undertaking the journey without unnecessary suffering prior to export by sea or air to any place outside Europe.

In order to safeguard horses which have been conveyed to this country from Ireland from undertaking further travel if unfit, the Horses (Landing from Northern Ireland and the Republic of Ireland) Order 1954 requires them to be landed at specified ports and to be examined and certified fit before undertaking further travel.

With the development of intensive methods of animal husbandry, the balance between economic necessity and animal welfare has grown more delicate. Conscious, as ever, of the public feeling on these matters, the Minister of Agriculture and the Secretary of State for Scotland set up a Technical Advisory Committee on Intensive Husbandry Systems in June 1964. The Committee, with Professor Rogers Brambell as chairman, was appointed 'to examine the conditions in which livestock are kept under systems of intensive husbandry and to advise whether standards ought to be set in the interests of their welfare and if so what they should be.' The report of this Committee is expected sometime in 1965.

This chapter, then, is largely a recording of the detailed legislation in connection with the welfare of animals during the past century. The volume and variety of this legislation reflects the very real anxiety of both the public and Parliament to do everything in their power to prevent avoidable suffering of animals, whether domesticated or wild.

PLATE XVII



Inspection of Irish cattle at the Birkenhead authorised landing place

PLATE XVIII



London Quarantine Station: a general view of the station; a brick building standing within a fenced background, with locked entrance gates. The site is within the dock estate, which is also enclosed and subject to security control, and both are in an exclusively urban area

PLATE XIX



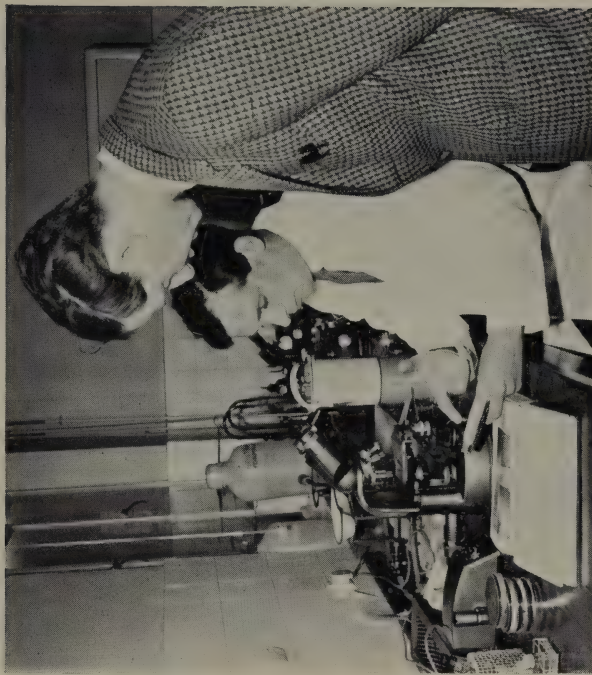
The Veterinary Investigation Centre, Cambridge, 1959. Part of the animal accommodation is shown on the left; in the background are the incinerator and two post-mortem rooms; and on the right are the main laboratories, with the offices and main entrance in the foreground

PLATE XX



A scientific assistant preparing cultures from samples received
at a veterinary investigation centre

PLATE XXI



A veterinary surgeon in practice consulting the veterinary
investigation officer in his laboratory

PLATE XXII



The Laboratory of the Board of Agriculture at Whitehall Place in 1904. The caption to the original photograph, taken for the *County Gentleman*, read: 'Mr J. McIntosh McCall, MB, MRCVS, Assistant Veterinary Officer, and his Handy-man. Observe the pieces of pig from the provinces on the wire screens for investigation, and the labels above. The cages contain rabbits and guinea-pigs for inoculation experiments when necessary.'

PLATE XXIII



The poultry post-mortem room at Weybridge, 1961

PLATE XXIV



A technical assistant using the rapid whole-blood plate test for detection of pullorum disease (B.W.D.) on the farm

PLATE XXV



Brucellosis: a veterinary officer carrying out S 19 vaccination of calves

PLATE XXVI



A swine fever enquiry

PLATE XXVII



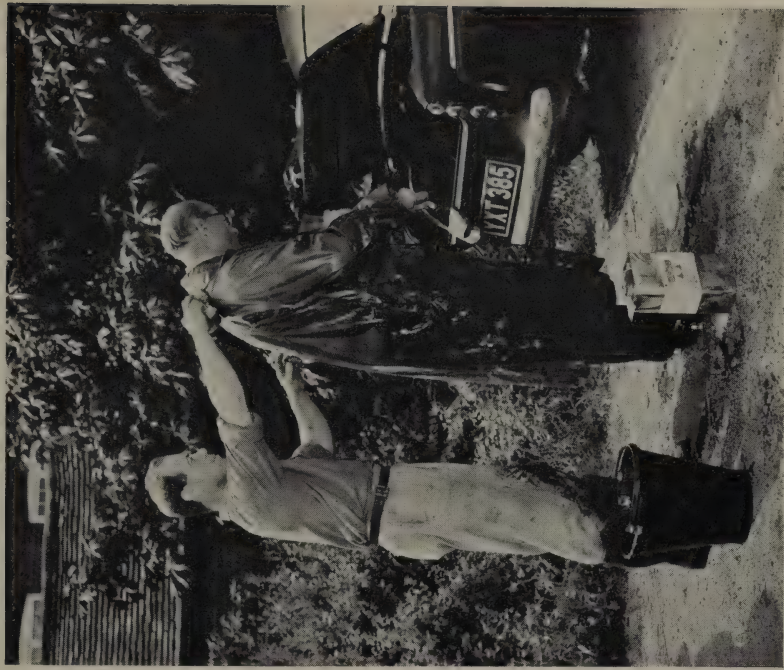
A veterinary officer tuberculin testing an animal in a crush

PLATE XXVIII



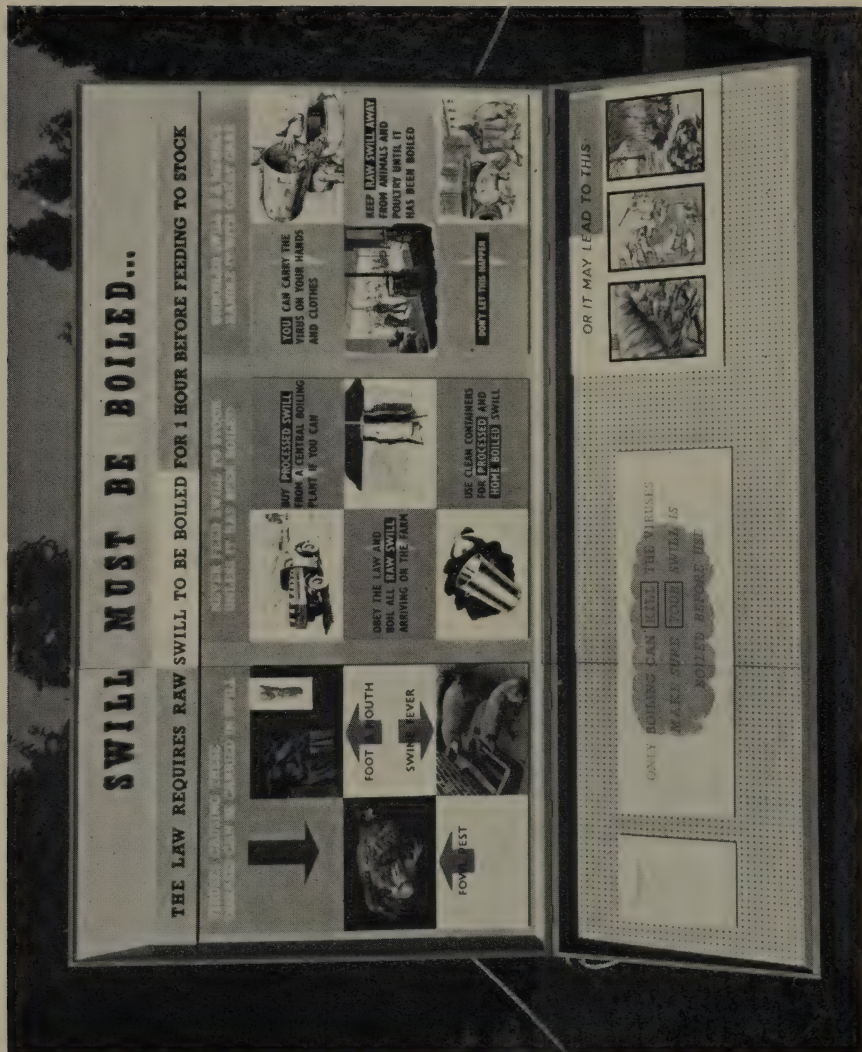
Foot-and-mouth disease?

PLATE XXIX



A matter of routine. A veterinary officer disinfects his protective clothing, assisted by the farmer

PLATE XXX



An exhibit produced by Information and Investigation Division for use at agricultural shows

Chapter 5

Research and Investigation

THE CENTRAL VETERINARY LABORATORY, WEYBRIDGE

ADEQUATE facilities for research and diagnostic work are essential for the control of animal diseases. Over the years this need has become increasingly apparent and the Central Veterinary Laboratory at Weybridge, first established in 1917, has expanded both in scientific and technical manpower and in laboratory and animal accommodation to meet this demand.

Limited facilities for laboratory work were available before the Weybridge site was acquired, firstly in rooms which were adapted for the purpose in 1894 at Whitehall Place in London, then in premises at Sudbury and subsequently, in 1908, at Alperton Lodge, Wembley.

After a few years at Alperton it became apparent that, owing to the ever-increasing amount of work, research and diagnosis were hampered and in some cases prevented by lack of laboratory facilities and animal accommodation.

In December 1912 the President of the Board of Agriculture, Walter Runciman, appointed a committee, with Lord Lucas as chairman, to consider a scheme for providing an Institution for Research into the Diseases of Animals. The Report of the Committee contained the following sentence: 'We venture to express our opinion that such an Institute is absolutely necessary to enable the Board of Agriculture to fulfil its duties to stock-owners and for the amelioration of the disabilities arising from diseases of animals under which farmers suffer'.

Arising from the recommendations of the Committee, application was made to the Development Commission for a laboratory grant. The Development Commissioners recommended that a sum not exceeding £28,650 be granted from the Development Fund to the Board of Agriculture and Fisheries for the purchase of land and erection and equipment of a new Veterinary Laboratory.

A site was found which formed part of the Moated Farm Estate, Addlestone, Weybridge, Surrey. The conveyance of the property was signed on the last day of 1914 but because of the war the laboratory buildings were not completed until the summer of 1917.

Sir Stewart Stockman was appointed Director of Research in addition to his post of Chief Veterinary Officer. Six veterinary officers, seconded from the field staff of the Board, formed with the Director the professional staff of the laboratory with five technical assistants, three animal attendants and one clerical officer. Stockman took great personal interest in research into contagious abortion and redwater of cattle, scrapie, louping-ill, swine fever, foot-and-mouth disease and certain diseases of poultry.

The re-introduction of rabies in 1918 and its subsequent spread resulted in many specimens being submitted to the laboratory for diagnosis. At the same time a much greater interest developed in poultry diseases. Breeders and other poultry owners were increasing their flocks, the incidence of disease was mounting and specimens were received at the laboratory in ever larger numbers.

In 1926 Stockman went to the Argentine to see the conditions there in connection with the export of meat to this country and to examine the effect of the regulations designed to prevent the carcasses of cattle infected with foot-and-mouth disease being sent to Great Britain. Stockman's health had been indifferent for some time and shortly after his return he died.

Following his death his duties were divided; J. J. R. Jackson became Chief Veterinary Officer, and W. H. Andrews was made Director of Research.

When Andrews was appointed to Weybridge the establishment of professional officers provided for a director and three research officers, with a variable number of veterinary officers seconded from the field staff of the Ministry of Agriculture. Andrews was appointed a member of the Foot-and-Mouth Disease Research Committee and was associated with its Third Progress Report. Subsequently he became responsible for supervising the investigations at the Experimental Station at Pirbright. The Fourth and Fifth Progress Reports of the work carried out for the Committee at Pirbright were published during his period of office.

About ten years following the appointment of Andrews, wings were added to the west and east of the main building, projecting northwards, which provided a large number of good laboratories in the west, and clerical and stores accommodation in the east. In addition, three new blocks were erected for production of tuberculin and research into its properties, research and diagnosis of diseases of poultry, and for production of an anti-abortion vaccine. These large blocks were completed and occupied in September 1939 providing accommodation which proved adequate for many years for the work which was envisaged. In the same year two adjoining farms of 48 acres and 85 acres were purchased and provided much needed accommodation for farm livestock required for research purposes.

Andrews remained at Weybridge until 1941 when he moved to other duties at Head Office of the Animal Health Division. His period as Director had been one of expansion, both of staff and accommodation, and it saw the establishment of the

Departments of Poultry, Parasitology, Bacteriology, Pathology and Biochemistry and the Laboratory at Lasswade, Edinburgh, for work on poultry diseases.

T. Dalling, Professor of Animal Pathology in the University of Cambridge, was appointed Director of the Laboratory in succession to Andrews and took up his duties in January 1942. This was a very difficult period. It was more than two years after the beginning of the Second World War so that supplies were scarce but the research work and diagnostic services had to be maintained.

Among the measures taken to assist with food production in the United Kingdom was the introduction in 1940 of the American Strain 19 *Brucella abortus* vaccine; a step designed to reduce the incidence of abortion and thereby increase the milk supply from the national herd. One of the laboratory blocks was adapted for large scale production purposes.

Another measure, designed to prevent wastage in dairy herds, was the appointment in 1943 of sterility advisory officers to assist veterinary surgeons in dealing with problems of infertility.

The professional and other staffs were augmented to meet the demand by the farming community for more assistance with the disease problems of their livestock and the urgent necessity for more food.

In August 1948 Dalling was appointed CVO and for a time he continued also as Director of the Laboratory. He vacated the latter post in 1950 and was succeeded as Director by A. W. Stableforth who, in turn, was succeeded as Deputy Director by E. L. Taylor.

During the later years when Dalling was Director it became possible for plans of new buildings to be prepared, but most of the actual construction took place during Stableforth's time. Some were to house departments which had outgrown their original allocation, others for newly created departments, and still others to provide considerable isolation units for animals and to replace temporary war-time accommodation. The space originally allotted to the library had become quite inadequate, and an excellent new building was provided to house both it and the Commonwealth Bureau of Animal Health. The room previously used for meetings and conferences was converted into laboratories and replaced by a new structure which included a conference room and canteen.

A new and very large laboratory block for the Biological Products and Standards Department was opened in October 1956 by the Minister. Stableforth's period as Director also saw the establishment of the Departments of Virology and Diseases of Breeding. Another new unit, for the Departments of Parasitology and Biochemistry, was completed in 1964.

Stableforth retired in May 1963 and was succeeded by H. I. Field, who had taken over as Deputy Director on the retirement of E. L. Taylor in 1959.

The Veterinary Laboratory Services, comprising the Central Veterinary Laboratory, the Laboratory at Lasswade and the Veterinary Investigation Service, form an effective combination with the Field Service for the control of diseases in farm livestock which are of economic importance or which have a public health significance. The work of the laboratories is complementary to that of the field service and there is, of necessity, close co-ordination of their activities.

Because of its special position within the Animal Health Division, the work at Weybridge covers a wider range of activities than is usual in a research laboratory. Further, the research programme is liable to not infrequent interruption in order to deal with problems which may arise suddenly and unexpectedly; recent examples are the study of aflatoxicosis in farm livestock and fluoroacetamide poisoning in cattle and other animals.

There are now eight departments at Weybridge; the five discipline departments of Bacteriology, Virology, Parasitology, Biochemistry and Pathology, and the specialist departments of Diseases of Breeding, Poultry, and Biological Products and Standards.

The following description of the work carried out in the various departments shows how the activities of the Laboratory form an integral part of those of the Animal Health Division, both in the national and international fields.

BACTERIOLOGY

The Animal Health Division has been heavily engaged since the war in an accelerated programme aimed at the elimination of tuberculosis from the cattle population; a programme which reached a successful conclusion in 1960. The Bacteriology Department actively participated in this work by examining lesions from reactor cows, preparing cultures and subsequently identifying the type of tubercle bacillus. Apart from its value in confirming, or otherwise, the presence of tuberculosis, this work also provided the Division with valuable evidence on the relative incidence of the various types of tubercle bacilli in the cattle population. The need for this service remains for as long as tuberculin testing continues to be carried out.

The department also furnishes other essential services; it provides a typing service for varieties of salmonellae and coliform bacteria isolated from various species of farm livestock; it prepares sera against a variety of bacteria for use in diagnostic laboratories, mainly in the investigation centres, and it carries out serological tests which may be required for import and export purposes.

The main emphasis on the research side in recent years has lain with mastitis and Johne's disease, both of which are of considerable economic importance in cattle. A successful experiment, lasting some five years, has recently been concluded to assess the value of calfhoo vaccination in preventing clinical Johne's disease in adult cattle. This

experiment has largely contributed to the acceptance of this method of prevention for use in infected herds.

Two herds of dairy cattle, one of which consists of identical twins, are maintained for mastitis research. They are used to study various aspects of the disease, in particular the routes by which bacteria gain access to the udder and the means by which their numbers can be controlled. The evidence obtained from the experimental herds can subsequently be used to develop methods for the control of the disease in commercial herds, and a trial is currently in progress in which some forty herds are attempting to control mastitis using methods arising from work done at the laboratories and elsewhere.

Advances and changes in husbandry methods commonly bring with them their own problems; as an example, intensive methods of rearing calves in large numbers have given rise to an increased incidence of respiratory disease. This has proved to be a complex problem involving several viruses and bacteria and has required a collaborative study with other departments. The Bacteriology Department has been concerned with one of these agents, a mycoplasma; studies have been made on the spread of the organism, the serological response to infection and its effect on calves either alone or in combination with other infective agents. This is an example of a problem which arises unexpectedly and requires immediate study; there have been others, such as 'Q' fever in cattle and sheep, which are either important in the species concerned or of public health significance and must therefore be given attention.

VIROLOGY

This department plays an active part in the diagnosis of swine fever. Symptoms and post-mortem findings in this disease are not always sufficient to establish a diagnosis and laboratory help is required. The gel-diffusion test has been successfully developed and pancreas found to be the most suitable tissue to examine for the presence of virus. Arising from this work, the department also established a relationship between swine fever virus and the virus associated with diarrhoea in cattle. A fluorescent antibody technique using splenic material has also been evolved as a diagnostic aid.

Assistance is provided to the veterinary investigation centres through the examination of suspect material or blood samples for the diagnosis of virus diseases such as mucosal disease.

The development of tissue-culture techniques has opened up a vast field for the isolation and study of viruses, thus making it possible in many cases to dispense with the use of laboratory animals.

The range of subjects dealt with since the department was established covers a wide field including myxomatosis of rabbits, the distemper complex, adaptation of swine fever to rabbits, duck virus hepatitis, contagious pustular dermatitis of sheep, Teschen and Aujeszky's viruses of pigs and malignant catarrh of deer.

The subjects selected for current research are pneumonia, mucosal disease, infertility and abortion in cattle, enteritis and infertility in pigs and enteroviruses from both species. This has led to the isolation from cattle of the virus of infectious bovine rhinotracheitis (IBR) and several adenoviruses. Experimental studies have been carried out in cattle with IBR, para-influenza III (PI₃) virus, adenoviruses, psittacosis-lymphogranuloma-venereum (PLV) and reoviruses in order to assess the rôle these various agents play in causing respiratory disease as separate entities and in combination.

It has proved possible to classify bovine enteroviruses into several serological groups, one of which consists entirely of viruses isolated from herds with infertility and abortion problems.

Transmissible gastro-enteritis of pigs has been successfully reproduced experimentally with a virus isolated from natural outbreaks.

PARASITOLOGY

The department was established quite early in the history of the Laboratory and has since developed to cover the whole range of economically important diseases of parasitic origin. It is now one of the largest of the departments, thus reflecting the importance of parasitic diseases in the livestock economy. There are four sections, each concerned with a specialised branch of the subject:

Entomology

One of the first tasks required of Weybridge after the First World War was to undertake research on sheep scab, a disease caused by a parasitic mite and at that time of great importance in Britain; now, happily, eradicated. From this humble beginning there arose the Parasitology Department, to include a section concerned with the study of ectoparasites. After the Second World War when benzene hexachloride began to show its outstanding qualities against mange mites and other insects, the section turned its attention to the study of sheep dips, and later studied other organochlorine compounds which contributed to the eradication of sheep scab and the more effective control of blowfly in sheep.

More recently its attention has been directed to the control of warble flies. Laboratory investigations cover the life history of the parasite, the implantation of larvae in experimental animals and an assessment of the effect on these of systemic insecticides.

Helminthology

Parasitic worms cause heavy losses in livestock in all parts of the world and a detailed knowledge of the life-histories of the various species involved is essential to their control. Much time and effort has been devoted at the Laboratory to the study of many aspects of parasitic infestations, mainly those affecting sheep and cattle.

The emphasis has been on epidemiology; working out the detailed life-histories of the parasites, the survival of eggs and larvae and the conditions under which they become active and/or infective; and studying the way in which resistance to re-infection arises, and the effects of drugs and changes in management on the different development stages and hence on the epidemiology of disease.

An example of the epidemiological approach is seen in the studies which have been made on the liver fluke (*Fasciola hepatica*). Considerable investigations of the parasite and its snail and mammalian hosts have involved the establishment and maintenance at Weybridge of large colonies of snails and the annual production of many thousands of young infective flukes. These studies, along with extensive surveys and trials in affected areas of Britain, have made it possible to forecast with considerable accuracy the weight of infection in the months ahead and to make suitable recommendations for control. Work along similar or related lines is being followed in other parasitic infestations caused by roundworms.

Protozoology

The main importance of protozoan parasites in farm livestock in Britain lies in their effects on poultry. The effects of these parasites increased as the poultry industry expanded and became more intensive. This resulted in a much higher incidence of coccidiosis, a disease caused by species of the protozoan parasite *Eimeria*, and it was to concentrate on methods of control of coccidiosis that a research worker was appointed in 1937. The field of work was subsequently expanded to cover disease caused by other protozoan parasites, including coccidiosis in turkeys and rabbits, blackhead in turkeys and trichomoniasis and babesiosis (redwater) in cattle. Although satisfactory methods for the control of poultry coccidiosis were evolved many years ago, other types of coccidia have emerged and each requires to be studied in detail so that suitable methods of control can be found.

Mycology

Fungi and moulds abound everywhere and until recent years they were considered of little consequence as disease agents. A section was established in 1954 as a reference laboratory, at the request of the ARC, to look at this problem. It soon became clear that fungi were of more significance than had been thought; for example, a high incidence of infection was found in aborted bovine foetuses and in placentae. Proof that these agents could be of even greater importance came in 1960 when it was established that heavy losses in turkey poults, and, subsequently, in calves and pigs, were due to a fungal toxin present in feedingstuffs.

This is a classical example of a problem which arose in the field with dramatic suddenness and required urgent attention in the laboratory. Collaborative study in

which the Poultry Department, Biochemistry Department and Mycology Section all played a part eventually found the solution.

An entirely new field of enquiry has been opened up by the finding that agents of this kind can produce toxins capable of causing illness and death in farm livestock.

BIOCHEMISTRY

Biochemical methods have been used at Weybridge in the study of animal diseases for rather more than thirty years. Starting in a modest way, the initial work was concerned with the elaboration of suitable methods for biochemical examination of biological material and, later, with establishing the normal range of certain biochemical constituents. This laid the foundation for much subsequent work on the investigation of metabolic disorders, mineral metabolism and toxicology, and for the setting up of a routine diagnostic service.

In the research field, studies have been mainly directed at procedures aimed at the diagnosis, prophylaxis and control of such important conditions of cattle and sheep as hypomagnesaemia, ketosis, pregnancy toxaemia and conditioned copper deficiency. Field and experimental studies on industrial fluorosis have characterised the problem and indicated the relative values of a variety of palliative and prophylactic measures.

As might be expected, problems have arisen from time to time which demanded the immediate attention of the department but were outside the range of its normal activities. Groundnut and fluoroacetamide poisoning are two recent outstanding examples. A technique was rapidly developed for the extraction of toxin from contaminated groundnuts, leading to its subsequent identification and the determination of its chemical structures. The identification of fluoroacetamide provided the solution to some puzzling losses in cattle and in dogs.

The studies of tuberculins played an essential and invaluable part in tuberculosis eradication in cattle. Later, procedures for the large-scale production of avian and mammalian PPD tuberculins were developed, and for some years the department has been the largest producer of PPD tuberculins in the world, having an annual output of 5,000 litres.

A routine analytical section provides a service to the veterinary investigation laboratories for the diagnosis of metabolic disorders, deficiency diseases and certain types of poisoning.

Within recent years a radio-isotope section was added, primarily to provide a monitoring service of animal products for radio-activity. The section is also developing research techniques using radio-isotopes for the study of animal diseases.

There has recently been a change of emphasis in the work of the department and a considerable proportion of the research effort is now moving towards more specialised studies in the fields of endocrinology, enzymology and toxicology.

PATHOLOGY

The Pathology Department is one of the smaller, but none the less valuable, departments at Weybridge. It provides a histo-pathological service for all departments and a common service for haematology and photography, including photomicrography.

It is responsible for the histo-pathological examination of brains from cases of suspected rabies, and assists in the diagnosis of swine fever by examining brains for the characteristic changes induced by the virus. Further, it examines large numbers of blood samples each year by the complement-fixation test for the confirmation of clinical Johne's disease and for certification purposes for sale or export of cattle.

In recent years Talfan disease was recognised and its relationship to Teschen disease established. Amongst other diseases of pigs with which the pig section has been concerned are atrophic rhinitis and inclusion body rhinitis, salt poisoning, congenital tremors, and diseases characterised by pathological changes in nervous tissue.

Much of the work on such diverse conditions as cerebro-cortical necrosis in cattle and sheep, swayback in lambs, enzootic ataxia in deer and calf pneumonia is carried out in collaboration with other departments, notably those of Virology and Biochemistry.

POULTRY

Diseases of poultry lend themselves less readily to the attention of specialist departments, because of their diversity, than do those of other kinds of farm livestock. Experience has also shown that in an industry in which changes in methods of management have occurred with great rapidity there is need to maintain an active diagnostic section alongside a research section, thus providing a link which enables new problems to be studied as they arise. For these reasons practically all the work on poultry is concentrated in one department.

A strong diagnostic section has been built up which, with the Lasswade Laboratory, has been responsible for all diagnostic work arising from the Poultry Stock Improvement Plan and, incidentally, antigens for the plate and tube tests for pullorum disease and fowl typhoid under the plan are prepared in the department.

Several diseases of poultry have been identified for the first time in Britain from specimens submitted to the diagnostic section. Included in an impressive list are Newcastle disease, fowl plague, infectious laryngo-tracheitis, fowl cholera (peracute type), infectious bronchitis, pullet disease, avian encephalomyelitis, duck virus hepatitis and infectious synovitis. These are therefore the diseases which have occupied the department. Investigations have given a better understanding of their nature and epidemiology, thereby leading to the development of suitable control measures.

Much of the effort on the research side is now devoted to the study of Newcastle disease, mainly in relation to the immunity afforded by vaccines of different kinds and

the effect of maternal antibody. Respiratory diseases generally, including mycoplasma infection, are also being studied and a reference section is being developed to assist other laboratories, including those of the investigation service, in the diagnosis of respiratory infections.

DISEASES OF BREEDING

The importance of infertility and abortion in cattle led to the establishment of a department for their study in 1956 although work in this field had been carried out for many years previously in other departments, mainly in Bacteriology.

The first task of the new department was to continue some studies which had been initiated in the Bacteriology Department on *Vibrio fetus* infection. A series of controlled experiments, combined with laboratory studies, established the mode of transmission and efficient methods for diagnosis and treatment. The findings have been confirmed by workers in many parts of the world. The adoption of the control methods evolved as the result of these studies has reduced the incidence of this infection to a level at which it is no longer of economic importance.

Much of the effort of the department has subsequently been devoted to a study of various aspects of brucellosis. It is now possible to type brucella strains by the use of bacteriophages and the study of their oxidative metabolism. It has been shown that strains isolated from cattle in Britain and previously classified as *Br. melitensis* are biotypes of *Br. abortus*, an important finding in establishing the freedom of the national herd from *Br. melitensis* infection, which is, of course, of considerable public health importance.

The Laboratory is a FAO/WHO Brucellosis Centre and as such is responsible for the production of International Standard anti-*Br. abortus* serum and monospecific typing sera, for the typing of brucella species and for the preparation, storage and issue of brucella type strains.

The department supplies the investigation centres and other laboratories with the antigens used for the blood agglutination and milk ring tests for *Br. abortus* infection.

Collaborative studies have been carried out with the Virology Department on the association of viruses with infertility in cattle. Another problem receiving attention is artificial insemination in turkeys, an interest which was first stimulated by the losses which had occurred in some turkey-breeding units when this method of mating was adopted.

BIOLOGICAL PRODUCTS AND STANDARDS

This department was established in 1956, the various sections being derived from a number of different components which had been in existence for some years. It prepares all the culture media for use in the laboratory and it undertakes such technical and biological tests as are required for the confirmation of the diagnosis of anthrax.

On the production side it is responsible for preparation and issue of the Strain 19 *Br. abortus* vaccine used in calfhood vaccination. For some years vaccine was issued as a liquid vaccine; more recently the organisms have been grown by a continuous culture process and the vaccine has been issued in a freeze-dried form. Production exceeds one million doses a year.

The department was also responsible for the manufacture of crystal violet swine fever vaccine and for some years output ran at around one to one and a half million doses annually. Production was stopped early in 1964 and issue ceased in August of that year.

A vaccine against Johne's disease for use in calves is also produced. Its value having been demonstrated in field trials and large-scale protection experiments, vaccination in known infected herds has been permitted since 1964.

The Diseases of Animals (Therapeutic Substances) Order came into operation in 1952, whereby production of veterinary biological substances in this country, and their importation from abroad, were controlled. The Order places a responsibility on Animal Health Division to approve premises in which biological products are prepared and to ensure that such products are sterile and free from toxicity. The department takes an active part in this work both in the inspection of premises and the testing of biological products.

The introduction of inactivated vaccines for the immunisation of poultry against Newcastle disease in 1962 means that the department has been engaged on a continuous testing programme to ensure that the vaccines are of an acceptable standard of potency.

THE LABORATORY AT LASSWADE

THIS laboratory officially opened for the receipt of specimens on 21 August 1939. For many years previously, agglutination testing and post-mortem examinations of poultry for the Accredited and Poultry Improvement Schemes of the Department of Agriculture for Scotland had been carried out at the Royal (Dick) Veterinary College, Edinburgh. In 1938, however, it was considered by the Ministry of Agriculture and Fisheries that a continuing arrangement with the College to provide similar services arising in implementation of Section 24 of the Agriculture Act of 1937 would lead to administrative and other difficulties, and it was decided that the Ministry should acquire a suitable property near Edinburgh which could be converted into a laboratory. Eskgrove, a substantial stone-built mansion house in about four acres of ground near Lasswade, was purchased in August 1938; the Laboratory is ideally situated just over six miles from the centre of Edinburgh and within a few miles of the Royal (Dick) School of Veterinary Studies, the Science and Agricultural Departments

of Edinburgh University, the Institute of Animal Genetics, the Poultry Research Centre, the Centre of Rural Economy at Bush Estate and the laboratories of the Animal Diseases Research Association at Moredun.

The Laboratory began in a small way. J. E. Wilson, who had previously been responsible for poultry work at the Royal (Dick) Veterinary College, was appointed officer in charge. It had been the intention in the first place to confine its scope to work associated with the official poultry schemes in Scotland but it had been foreseen that later its activities might be extended to the north of England. This happened in 1941 when, as a result of war-time difficulties in transport of material to Weybridge, the Laboratory at Lasswade became responsible for poultry work from the six northern counties of England. This included a fee-paying service for poultry-farmers generally, and a similar service was made available to poultry-farmers in Scotland. Work increased rapidly and, in 1944, 4,000 post-mortem examinations and more than 325,000 agglutination tests for pullorum disease were carried out. Expansion continued and in 1948, the last year in which the tube test was the official test in Scotland, over 520,000 tests and more than 7,000 post-mortem examinations were performed. From 1947 to 1951 the production and issue of fowl pox vaccine was also undertaken. During each of the past eight years between 11,000 and 12,000 adult fowls and between 2,000 and 3,000 batches of chicks have been received for post-mortem examination. In addition, causes of impaired hatchability have been investigated and about 500 captive and wild birds are examined annually.

Early in 1945 a certain amount of large animal work was undertaken; mainly the examination of material for tuberculosis under the Attested Herds Scheme. Strain 19 *Br. abortus* vaccine was produced at Lasswade from 1945 until the end of 1949; and from 1954 until late 1963 crystal violet swine fever vaccine was made and issued to veterinary surgeons in Scotland and the north of England; from time to time this area was extended.

As a result of war-time conditions during the early years at Lasswade use had to be made of a variety of largely pre-fabricated buildings. This permitted essential work to be carried out but was obstructive to a planned and orderly development. Buildings erected later were of a higher standard, and there are now excellent facilities for the production and maintenance of healthy poultry for experimental purposes and for the isolation of diseased poultry.

The primary objective of the Laboratory was the provision of an efficient and speedy diagnostic service. Through staffing limitations research work has largely been of an *ad hoc* nature dealing with problems of current importance; a list of some of the investigations carried out pin-point the problems, local or general, which have beset the poultry industry during the period of the Laboratory's existence: 'six-day' chick disease; cocoa-bean poisoning; the epidemiology and prevention of salmonellosis and

fowl typhoid; hatchery hygiene; formaldehyde fumigation; production of strains of fowls resistant and susceptible to fowl paralysis; round heart disease; curled tongue; hexamitiasis of turkeys; caterpillar poisoning in ducks; the effect of Newcastle disease virus in fish, cormorants, gulls and other wild birds; mycoplasma infections in chicks and turkeys; the effect of dressed grain on wild birds, and control of wild bird populations by the use of narcotics. Among the more important contributions have been the demonstration in 1945 of the importance of shell contamination as a means of introducing salmonella infections into the incubator, which until then had been overlooked in this country; the limitations of the agglutination test as a preventive measure; the recommendation that hatching eggs should be fumigated with formaldehyde; and, later, the occasional importance of direct egg transmission of *Salmonella typhimurium* in hen eggs; the production of round heart disease in fowls placed on litter from outbreaks, or through contact with affected fowls, and of a fowl plague-like disease caused by influenza A. virus; the demonstration of a resistant stage of the life-cycle of *Hexamita meleagridis*, and the importance of egg transmission of mycoplasmosis in chicks and turkeys.

Lasswade has attracted over 2,000 visitors from many parts of the world and poultry specialists and post-graduate students from home and abroad have spent varying periods in it gaining experience of diagnostic procedures.



Although this account of the Central Veterinary Laboratory and the Lasswade Laboratory and their activities has been necessarily brief and has not taken account of the many problems which arise unexpectedly, and to which attention must be given, enough has been said to give an indication of the way in which their work forms an integral part of the activities of the Animal Health Division in the control of animal diseases which are of economic or public health importance.

Among the contributions which the laboratory services make in the international field are the general facilities that are provided for training research workers and technicians from other countries. In 1964 there were visiting workers at Weybridge from Iran, India, Western Nigeria, Uganda, Northern Nigeria, Pakistan and New Zealand. A further contribution lies in the assignments undertaken overseas by members of the staff, limited, unfortunately, because of the need to maintain the research and other programmes at a proper level.

There are, however, more specific international activities and some account of two of these must be given.

THE COMMONWEALTH BUREAU OF ANIMAL HEALTH

The Imperial Agricultural Research Conference held in London in 1927 recommended the formation of an organisation to be known as the Imperial Agricultural Bureaux

and a scheme was agreed in 1928 by the United Kingdom and overseas Governments.

The organisation was to consist of eight bureaux together with the Institutes of Entomology and of Mycology and its function was to collect, collate and disseminate information for research workers in agricultural science throughout the Empire. It was, and continues to be, financed by contributions from Governments in the Commonwealth.

Each bureau was to cover a particular branch of agricultural research and be located at an analogous laboratory. As a consequence the Bureau of Animal Health opened at the Central Veterinary Laboratory, Weybridge in October 1929 with Dr W. H. Andrews as ex-officio Director and W. A. Pool as 'Deputy Director or Chief Officer in direct charge of the Bureau'.

These designations proved to be confusing and were changed in 1943. The Chief Officer in charge of the Bureau became Director of the Bureau, and the Director of the Laboratory became the Consultant Director.

On 1 January 1948 the name of the organisation was changed to the Commonwealth Agricultural Bureaux, and the Imperial Bureau of Animal Health became the Commonwealth Bureau of Animal Health.

The first regular publication was the abstracting journal *The Veterinary Bulletin* which first appeared as a quarterly in April 1931 but subsequently became a monthly journal. The second, the *Index Veterinarius*, made its appearance in 1933. Both are now universally known and constitute a unique British contribution to veterinary science. A third, *Veterinary Reviews and Annotations*, was issued from 1955 to 1961 inclusive but from 1962 onwards the review articles have been included in *The Veterinary Bulletin*. The Bureau from time to time publishes short monographs in its Review series.

The Bureau answers enquiries and supplies references, reprints, photo-copies and other material to research workers throughout the world.

Since 1929 there have been four consultant directors, Dr W. H. Andrews, Sir Thomas Dalling, Dr A. W. Stableforth and H. I. Field; and two Directors, W. A. Pool (1929-55) and M. Crawford.

THE INTERNATIONAL LABORATORY FOR BIOLOGICAL STANDARDS, WEYBRIDGE

The international system of biological standards was started by the Health Organisation of the League of Nations and continued, after the Second World War, by the World Health Organisation (WHO). The system was originally concerned solely with standards for medical use and two laboratories were designated to deal with them. The Statens Seruminstitut in Copenhagen was given charge of immunological standards and the National Institute for Medical Research in London of pharmacological standards.

There has been considerable interest in the standardisation of biological products at Weybridge. In conjunction with OIE a standard for *Br. abortus* serum was established in 1933, and this serum has been distributed since 1937. Based on this, WHO established an international standard *Br. abortus* serum in 1952. This was the first purely veterinary international biological standard; many have been developed since. The WHO Expert Committee on Biological Standardisation, following encouragement from the Sixteenth IVC at Madrid, considered 'expansion of the Committee's work, particularly in respect of substances of veterinary importance', and recommended that FAO 'be consulted concerning the possibility of nominating a Third International Laboratory for Biological Standards with the responsibility for the custody and distribution of these international standards and international reference preparations that are primarily of veterinary importance'.

In October 1961 WHO invited H.M. Government to agree that the Central Veterinary Laboratory should be designated the Third International Laboratory for Biological Standards. This high honour was accepted. The Laboratory undertakes, in co-operation with the other two international laboratories, the preparation, storage and world-wide distribution of those international biological standards which are primarily of veterinary importance. It is responsible for the replenishment of stocks of various standard preparations, taking particular care to ensure that no international standard is allowed to lapse. It carries out, with the approval of the Ministry, research work entrusted to it by WHO upon existing standard preparations and standardisation of other biological substances, often in collaboration with other laboratories.

The Laboratory supplies on request samples of those international biological standards of which it is the custodian to national laboratories for biological standards or to other laboratories concerned with the control of veterinary biological products. A laboratory receiving international biological standards prepares its own national standards from the international sample.

The Laboratory is currently concerned with the development of standards for a variety of veterinary biological products.

THE VETERINARY INVESTIGATION SERVICE

BEFORE the First World War an agricultural advisory service was set up in university departments of agriculture and in agricultural colleges throughout England and Wales, and by 1914 agricultural advisory centres were established at Aberystwyth, Bangor, Bristol, Cambridge, Leeds, Newcastle, Reading and Wye. This service was primarily intended to disseminate to the farming community information arising from research, and the subjects dealt with included agricultural chemistry, dairy bacteriology, plant-

DISPOSITION OF THE ANIMAL HEALTH DIVISION

- * Head Office : TOLWORTH, Surrey
- Central Veterinary Laboratory, Weybridge, Surrey
- ⊕ Veterinary Investigation Centres
- Quarantine Stations
- ⚓ Authorised Landing Places
- Regional Boundaries
- - - Divisional Boundaries
- ... County Boundaries



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pathology, entomology and agricultural economics. The areas served by the agricultural advisory officers were known as provinces and there were two in Wales and six in England. As a result, many miles had to be travelled by the advisory officer to reach farms on the borders of his province. For example, the Reading province included Dorset and Northampton, an area stretching for 170 miles from the Devon-Dorset border almost to the Wash.

After the First World War representations were made by farming organisations for technical advice on veterinary matters and the initial appointment of a veterinary advisory officer was made to Cardiff in 1922, followed by Newcastle in 1923, Bangor in 1924, Sutton Bonington in 1925, Liverpool in 1927, Harper Adams and Wye in 1929, Bristol and Starcross in 1931, and Reading and Cambridge in 1932. After a lapse of eight years a centre was established at Leeds in 1940 and one at Aberystwyth in 1943. Additional centres were built and staffed at Weybridge in 1950, Penrith in 1953, Worcester in 1956, Norwich in 1958, Thirsk in 1960 and Truro in 1964.

The officer in charge of a veterinary investigation centre was in the early days known as a veterinary advisory officer. In 1935 this title was changed to veterinary investigation officer but the duties remained precisely the same. The VIO was responsible to the Professor of Agriculture or to the Principal of the agricultural college to which he was attached. He had very close contact with his colleagues in other branches of agriculture, in particular the agricultural chemists who at that time dealt with animal nutrition as well as the chemistry of soil. Close contact was also maintained with the dairy bacteriologist on problems of mutual interest.

When the National Agricultural Advisory Service was set up it was considered appropriate to incorporate the veterinary element in the Animal Health Division and this was done in October 1946 with a superintending veterinary investigation officer in charge of the whole service under the Director of the Central Veterinary Laboratory. In 1955 another superintending veterinary investigation officer post was created and in 1959 the svio at Weybridge was promoted to the new post of Deputy Director of the Veterinary Investigation Service.

Before 1946, veterinary investigation officers met once every year in London when the annual reports were discussed but, following the appointment of the svio, vios met three times yearly to discuss current problems and to plan future work. Every vio now submits a report on his work to his senior officer at the end of each month. The reports are summarised and circulated to all members of the Veterinary Investigation Service and to their colleagues in the Field Service. Thus everyone is fully aware of what his colleagues are engaged upon and unnecessary duplication is avoided. Trials on a national scale, as for example the use of organic phosphorus compounds for the destruction of warble larvae, are planned centrally and carried out in precisely the same manner at all the centres which participate.

At each centre there are professional and technical staffs with a complement of shorthand typists and clerical officers. Normally the VIO is supported by one to three professional colleagues, and a well-trained senior technician who is usually an experimental officer and is probably an Associate or Fellow of the Institute of Medical Laboratory Technology. Additionally, there are three or four scientific assistants, normally recruited directly on leaving school, who are encouraged to study for the examinations of the Institute. Two laboratory attendants and an animal attendant complete the executive staff.

In 1946 most of the universities and university colleges who wished to complete their own post-war expansion no longer wanted to house the VI centres. Many of the latter had, therefore, to be moved to temporary and not altogether suitable premises, but in due course every centre was satisfactorily re-housed. Some of the veterinary investigation centres occupy dwelling-houses, factory premises or ex fire-service huts suitably converted.

Five centres were purpose-built as small self-contained units and it is probable that any centres built in the future will follow this pattern. The typical centre consists of a laboratory block of about 3,600 sq. ft. and another block for post-mortem room and small animal accommodation. In the laboratory block there are at least four laboratories, media preparation, washing up, sterilising, mess and store rooms, an office for the officer in charge, with small library adjoining, and a general office for the telephone switch-board and the clerical staff. The post-mortem room is equipped with lifting tackle to cope with adult cattle. Adjoining is the reception room where the veterinary surgeon or farmer brings his specimens and discusses the problem. A 'walk in' cold store is placed beside the post-mortem room and accessible directly from it. The rest of the block consists of rooms for small animals and food stores. The whole unit has its own central heating system and its own incinerator, gas or oil fired, enabling it to overcome the problem of disposal of post-mortem material—a serious factor in urban and even in some rural areas.

Each investigation centre serves an area which comprises two to six counties, except for Leeds which provides laboratory facilities for the East and West Ridings, and Thirsk which covers the North Riding. The animal populations of the areas covered by each centre are very variable; from a quarter to one million cattle, from a quarter to two and a quarter million sheep, from eighty thousand to half a million pigs and from one to twelve million poultry. The number of veterinary practices which send material to the centres is also variable—from thirty to over a hundred.

The Veterinary Investigation Service has an important place in the work of the Animal Health Division. Essentially it furnishes local laboratory facilities to assist veterinary surgeons in practice with diagnosis and enquiry into herd and flock problems and constitutes, in a sense, a consultative service. At the same time the centres act

as the field element of the central laboratories, carrying out co-operative experimental work, including field trials and taking part in disease surveys. The Service also brings to notice problems of disease which are of local concern and may be important nationally, in which case the Director of the Central Laboratory may decide that research is necessary, or action may be taken by the field staff.

Laboratory examinations of specimens for diagnostic purposes from all classes of livestock occupy most of the time of the professional and technical staff at all centres. If, in the course of his duties, a member of the staff suspects the presence of a notifiable disease he immediately reports his suspicions to the divisional veterinary officer who then takes complete charge of the case. The diagnostic work continues to expand, 218,829 examinations being carried out in 1963. An enquiry carried out in 1956 showed clearly that the bulk of post-mortem material came from within a radius of 50 miles of the centre. This is almost certainly connected with the fact that where dispatch by rail is necessary the material may not reach the laboratory in a state fit for examination owing to putrefactive changes. The enquiry showed that 77 per cent of post-mortem material came to the centre from a radius of 40 miles and 89 per cent of the total from a radius of 50 miles. This fully confirms the need of the six centres built between 1950 and 1964 and indeed there are still some centres at a distance of 100 miles from the farm where a disease problem may arise.

Many of the tests carried out at the centres are bacteriological in nature but parasitological techniques are also widely used and many centres are developing work on virus isolations and identifications. The numbers of milk samples examined for mastitis organisms have remained fairly constant at about 30,000 per annum but in recent years there has been more demand for antibiotic sensitivity tests on the organisms recovered. There has also been a regular flow of blood samples from cattle for brucella tests but a dramatic decrease in the number of poultry blood samples for pullorum disease tests, from 26,361 in 1954 to 610 in 1964. This steep fall can be attributed to the increase in the number of flocks which have joined the Poultry Stock Improvement Plan in which blood testing is done by the field staff and also, perhaps, in part to the smaller poultry keeper himself doing the rapid test with equipment which he can now purchase. More and more use is being made of the Investigation Service by veterinary surgeons to diagnose the causes of enteric disturbances among farm livestock. Whereas 13,000 faecal samples from cattle were examined in 1954, over 30,000 were examined in 1964. Most of these samples require bacteriological examination for salmonellae, a worm egg count, a smear for *M. johnei* and probably a special technique for fluke eggs and for coccidia. It is, however, in post-mortem material that the greatest increases have occurred. The total of cattle carcasses, calf carcasses, foetuses and viscera which in 1954 was 4,839 rose to 11,691 in 1964. Post-mortem material from sheep also showed a similar increase over the same period, namely 4,093 to 11,221. Pig material in 1954

totalled 4,859 specimens and reached 13,571 in 1964. Poultry specimens were 18,377 in 1954 and 24,971 in 1964.

In addition to the laboratory tests VIOs visit farms, at the request of the veterinary surgeon, to investigate disease problems probably because a diagnosis is required or because there has been no response to treatment. Members of the staff give a limited number of lectures to veterinary and agricultural students. There is a considerable demand from the National Farmers' Union and Young Farmers' Clubs for lectures on animal health subjects during the winter evenings. These meetings may demand formal lectures or participation in discussion groups, and they serve a useful purpose in maintaining contact with the agricultural community. More recently investigation officers have been called upon to lecture to the field staff on civil defence matters and on diseases of poultry.

All centres are engaged on research problems on a small scale although, of course, the major problems are dealt with by Weybridge. If the VIO considers that some work should be done on a local disease problem he submits his proposals to the Director of the Laboratory Services for agreement, and once work has begun he makes regular progress reports. Generally the work is done in collaboration with the appropriate department at Weybridge, and the few examples which follow will suffice to indicate the sort of problems investigated.

The three centres in Wales are collaborating with the Parasitology Department at Weybridge in work on fascioliasis, and ten demonstration farms have been selected within the Principality. It is intended that the intermediate host snail will be controlled with the help of simple drainage schemes, or, where this is not possible, by the application of molluscicides. The animals on the farm, both cattle and sheep, will be dosed at regular intervals to remove the adult and near-adult flukes. By this procedure, over a number of seasons it is hoped to demonstrate quite clearly to the farming community that, where suitable preventive measures are taken, losses from liver fluke need not occur even after one or a series of wet summers. The observations made on these farms help the parasitologists to give a forecast of the probable incidence of fluke during the following winter based on the number of snails that are present in the habitats during the summer and on the number of snails that become infected with the intermediate stage of the liver fluke.

A number of centres are collaborating with the Biochemistry Department on hypomagnesaemia field trials which will run for a total of five years. Farms have been selected where severe losses from hypomagnesaemia have occurred. On each farm the pasture, which is used as soon as the animals are turned out in the spring, is divided by a fence, one half having been treated with calcined magnesite during the winter at the rate of 5 cwt. per acre. Each herd is split on the basis of age and stage of lactation, and blood samples are taken on two occasions before the animals go on to the experi-

mental pastures. Blood samples are then taken thrice weekly for a period of three weeks. Samples of herbage and soil are taken from experimental pastures throughout the grazing seasons and analysed by the chemists of the National Agricultural Advisory Service. The work is not yet completed but it has been shown that on certain acid soils there is sufficient uptake of magnesium by the herbage to give a useful measure of protection from hypomagnesaemia to the grazing animal.

Many of the centres collaborated with their opposite numbers in the Public Health Laboratory Service on studies into the epidemiology of *Salmonella typhimurium* infection. When a member of either service recovered *Salm. typhimurium* he reported this fact to his corresponding colleague. Thereafter the Public Health representative took samples from the people involved, wherever they might be, on farm or in shop, and the VIO tested all the animals on the farm—cattle, sheep, pigs and poultry. An attempt has been made to trace the source of infection in these outbreaks with the help of phage-typing of the strains recovered.

A study of the development of para-influenza antibodies in calves kept under intensive conditions during the winter months was conducted in collaboration with the Virology Department. Other centres are investigating the species of bacteria in lungs from calves which have died from pneumonia.

In investigating problems of infertility in cattle, where laboratory tests have been negative for the more common pathogens a study is being made of the effect of certain trace elements in the treatment of the condition. At one centre, for example, several hundred cows which had been discarded by farmers because of their failure to breed were examined over a short period of time and, following slaughter, their genital organs were submitted for laboratory examination.

During the last few years the Veterinary Investigation Service has carried out a number of surveys into the causes of death among pigs, sheep and calves and also participated in a brucellosis survey.

It has been agreed that a further expansion of the service may be made by gradually increasing the number of investigation centres to twenty-five. In each region in England and Wales one centre will be expanded to become a regional laboratory, with increased facilities for diagnosis. This will relieve the Weybridge Laboratory of much of its routine diagnostic duties. The officer in charge of each regional laboratory will be of the same rank as the deputy regional veterinary officer, he will have supervisory responsibility for the centres in his region, and the organisation generally will come under the regional veterinary officer. For all technical matters the DRVO (Investigation) will still be closely associated with the Weybridge Laboratory. He will be eligible for promotion to RVO and therefore to higher posts in the Animal Health Division. There will no longer be a Superintending Veterinary Investigation Officer.

PART THREE

Aspects of Disease Control

Chapter I

The International Scene

INTERNATIONAL organisations associated with health and agriculture have been closely concerned with animal health and most influential in the field of animal disease control in recent years, and members of the Animal Health Division or its predecessors have been privileged to play some part in their efforts.

It is not surprising that animal diseases are among the main interests of such bodies, for many diseases of animals may affect man. The importance of these zoonoses can hardly be over-emphasised since they flourish under the more primitive conditions of developing countries, particularly if there is no organisation capable of controlling the diseases of animals.

The opportunities for spreading disease from one country to another are enormous owing to the greatly increased international traffic of livestock and their products, and the fact that they can readily be transported by land, sea and air over much greater distances than formerly. When a developing country reaches a stage where its livestock industry has grown to the extent that products of animal origin are available surplus to the national requirement, there may well be a considerable risk of transferring infection between one country and another. All this was dealt with in some detail when importation into Great Britain was discussed. However, the fact that much can still be done to improve the animal health situation in developing countries, and to encourage trade on a safer basis by international co-operation, means that several international organisations are keenly interested.

The activity of such organisations has had a great influence on the international trade in livestock and livestock products and has been responsible for many advances in standardisation of biological products for veterinary use. Moreover, they have had a world-wide impact on several major diseases of animals, particularly on rinderpest, foot-and-mouth disease, pleuro-pneumonia, tick-borne diseases, African horse sickness, rabies, tuberculosis and brucellosis.

World Veterinary Association

The first International Veterinary Congress was held in Hamburg in 1863, largely at the instigation of John Gamgee of Great Britain. This Congress has since met every

four or five years, except for interruptions caused by the two world wars, and has been a forum for discussion of veterinary problems over the whole period of this history. At the earlier congresses many important matters were recorded soon after their discovery, and discussions on some subjects were lively and sometimes heated. Nowadays veterinary periodicals are available and are readily exchanged between one country and another, so that it would be rare for any new discovery to be published for the first time at a congress held every fourth year. Nevertheless the Congress still provides a unique opportunity for interchange of information and ideas between workers the world over. The IVC has been concerned with nomenclature of disease and one of its particular activities has been to catalogue veterinary films and films of veterinary interest.

The World Veterinary Association was formed after the 1958 Congress in Madrid, where the concept of specialist associations was accepted. These associations now hold their own congresses but they meet during the WVA congresses as well, which they did for the first time at the Centenary Congress in Hanover in 1963.

To mark the centenary, 1963 was designated 'World Animal Health Year'; and at the Hanover Congress a medal, to commemorate John Gamgee, was awarded to Sir Thomas Dalling in recognition of his outstanding contribution to veterinary science.

Office International des Epizooties

This organisation was founded in 1924, when representatives of twenty-eight countries met to ratify an agreement to set up an international office for dealing with contagious diseases of animals, as had been contemplated by the International Conference for the Study of Animal Diseases on 27 May 1921. It is of interest to note that the idea of setting up this international office followed the carriage of rinderpest to Europe in 1920, which is mentioned elsewhere in the text.

The function of OIE is largely to study the technical aspects of disease control, and to recommend to member governments methods by which the various diseases may be attacked. It also provides regular information on the distribution of disease, and its member countries send data for transmission at fortnightly intervals. It gives a summary of these returns annually, besides participating in the production of that useful source of information, prepared jointly with FAO and WHO, the *Animal Health Year Book*.

OIE has specialist committees on a number of important subjects and regularly keeps under review those diseases which are of current importance. On many occasions it has called conferences to discuss particular diseases which have spread into areas where they were formerly unknown, and has drawn attention to the need for co-operation in their control.

The delegates to OIE are usually the chief veterinary officers of the member countries.

Because this is the only international organisation dealing solely with animal diseases, it is exceptional for anyone other than a veterinarian to take part in the annual sessions.

The Chief Veterinary Officer has almost invariably been the delegate for Great Britain, which, for purposes of membership of this organisation, includes Northern Ireland. Sir Daniel Cabot was President of the Office for three years during his term of office as Chief Veterinary Officer.

Food and Agriculture Organisation of the United Nations

Besides taking the major share in producing the *Animal Health Year Book*, FAO takes a very active part in the international control of animal disease.

It has developed a useful system of working through expert panels on particular subjects. Those of main interest are the expert panels on veterinary education (jointly with WHO), on infertility and on tick-borne diseases. The panels have made notable contributions in their subjects, and publication of the proceedings has afforded valuable information and discussions on these matters. The system of expert panels within a wide membership permits consultation by correspondence and allows periodical meetings of selected members chosen to attend because of their specialist knowledge of the subjects to be discussed.

Upon request from a member country, FAO will send experts to assist with disease-control problems and to train members of local staff on the subjects in question. Several members of the staff of the Animal Health Division have worked for short periods in many parts of the world under these arrangements. FAO has recruited officers with wide experience following their retirement from the Division, notably Sir Thomas Dalling, Dr A. W. Stableforth and Mr E. C. Lloyd. FAO also awards fellowships, and Great Britain has been privileged on occasion to help with providing facilities for FAO fellows.

Many meetings are organised by FAO, frequently in conjunction with other organisations such as OIE or WHO. For example, there have been several meetings to discuss international traffic in livestock and a variety of livestock products such as meat and semen. Other meetings are called on matters which are of real importance in the international field, or to consider emergency situations as they develop.

The paramount interest of FAO is to ensure adequate world food supplies, and in recent years it has organised the Freedom from Hunger Campaign which has financed several disease-control projects.

FAO has also established the European Commission for the Control of Foot-and-Mouth Disease. This Commission was recommended at a meeting held in Copenhagen in 1952 following the serious epidemic which swept Europe from 1950 to 1952. Originally in 1954 there were six member countries and now there are sixteen. There is

no doubt that the Commission has had a significant influence on the disease situation in Europe, and an excerpt from its over-all plan in the control of the disease is quoted later in this book. Since the inauguration of the Commission the situation in Europe has improved enormously and during recent years more and more countries, following the principles outlined in the over-all plan, have reached a stage where it is economic for them to employ a stamping-out policy whenever foot-and-mouth disease appears amongst their stock. As already indicated, the success of the control measures in Europe has prevented those primary outbreaks of disease in Great Britain which originated from infection in western Europe.

However, the European Commission has not concerned itself only with that Continent. It has turned its attention to the situation in other countries from which disease may reach Europe. For example, it stimulated FAO to send a mission to study the disease position in South America because infection may be conveyed by meat and meat products.

The types of foot-and-mouth disease virus present in Europe have always been the three classical types, A, O and C, and the vaccines which have been developed are specific for these three virus types only. Because of this, the introduction of another type would be extremely dangerous for no protection would exist against it. Equally, it would be a matter of risk for Continental laboratories to work with these exotic types of virus lest they should escape and infect the stock in the neighbourhood. In consequence a considerable burden has been passed to the Animal Virus Research Institute at Pirbright, Surrey, which has been designated the World Reference Laboratory for Foot-and-Mouth Disease by FAO and OIE. Not only are strains typed from any country in the world but specific hyper-immune sera are provided for diagnosis of all types, thus avoiding the necessity for other countries to work with exotic viruses. Pirbright maintains a nucleus stock of inactivated vaccine against all the types exotic to Europe so that a vaccination programme may be mounted immediately an exotic virus type is identified.

The danger that arose to Europe from the appearance of virus SAT 1 (South African Territories 1), in the Near East and Turkey following its escape from Africa via Bahrein, was of particular interest to the Commission. On behalf of FAO and in conjunction with OIE a great deal of work was done, firstly by meetings which produced appreciations of the situation, and latterly by stimulating the production of vaccine against this particular type, and raising funds for its provision. Numerous visits by the secretariat and others to the affected countries have assisted with methods of control and have resulted in the establishment, at strategic points, of buffer zones in which all the susceptible animals are vaccinated. This has halted the march of infection towards Europe. Before this was achieved infection had spread into European Turkey and Greece. By slaughter of affected stock, and the application of the

well-tried methods of segregation, movement control and disinfection, supported by vaccination, the disease has been eradicated from Greece and from the greater part of European Turkey.

The provision of sufficient funds for the supply of vaccine, of transport facilities and vaccine production laboratories in the affected countries has resulted in adequate control as well as the provision of all the necessary equipment and organisation to continue the campaign.

Great Britain was the first to supplement the United Nations Contingency Funds which were used to provide equipment so that vaccine could be available. Subsequently practically every European country has contributed to the funds. Three members of the veterinary field staff have worked in succession in Turkey on behalf of FAO, and the Canadian Government and United States Agencies have also assisted in this way. All but very small quantities of vaccine used in the first two years of the campaign was produced at Pirbright.

Sir John Ritchie has been a member of the Executive Committee of the European Commission since its foundation and, more recently, has acted as its chairman.

World Health Organisation of the United Nations

This organisation is primarily interested in those diseases of animals that affect man. Committees on rabies and brucellosis have made particularly valuable contributions to the literature, to the knowledge and to the control of these diseases.

WHO has also concerned itself with standardisation of biological products and reference is made elsewhere in this book to the Central Veterinary Laboratory, Weybridge, as the Third International Standards Laboratory.

Principles and Practice of Preventive Medicine

VETERINARIANS in any country are responsible primarily for the control, prevention, treatment and elimination of diseases of animals. They should also ensure the comfort and well-being of the livestock population whether it be farm animals, so essential in the agricultural economy, or animals maintained for man's pleasure. An important feature of the work must obviously be the prevention of the introduction of disease with imports which may be livestock, livestock products or materials which might be contaminated. Another significant element concerns the public health. In the narrower sense, veterinary public health work reduces the risk of infection spreading from animals to man but it has a wider application by contributing, through control of animal diseases, to the adequate supply of those high-quality foods of animal origin which help to provide a good standard of living for a populace.

ORGANISATION AND STAFFING

In the first place, it is clearly necessary that a sound organisation be set up to undertake this work. The Animal Health Division of the Ministry of Agriculture, Fisheries and Food and the Department of Agriculture for Scotland carry the prime responsibility in this country. A field organisation must be supported by research establishments and there must be teaching institutions to provide a sufficient number of trained veterinarians.

For the successful control of disease an adequate staff must be employed. Originally, in Great Britain, very few veterinary surgeons were employed as officials of the Government, and much of the work was done by veterinary surgeons either in private practice or as employees of local authorities advising an administrative staff. At the turn of the century inspectors who had no veterinary qualifications were usually employed as enforcement officers, and one or two such officers were still on the Ministry staff and employed in the Animal Health Division when it was set up in 1938. Before then the central veterinary authority had confined its immediate interest to the more readily diffusible diseases such as foot-and-mouth disease and swine fever, leaving many others to be directly controlled by local authority employees assisted and supervised by the staff of the central authority. Obviously officers who are handling such

diseases as foot-and-mouth disease must not at the same time do other work among animals; it would be wrong for them to carry on private practice or to make routine inspections of stock, for even when every precaution is taken to avoid transfer of infection there is always the possibility that a coincidental infection might arise on one of the farms visited.

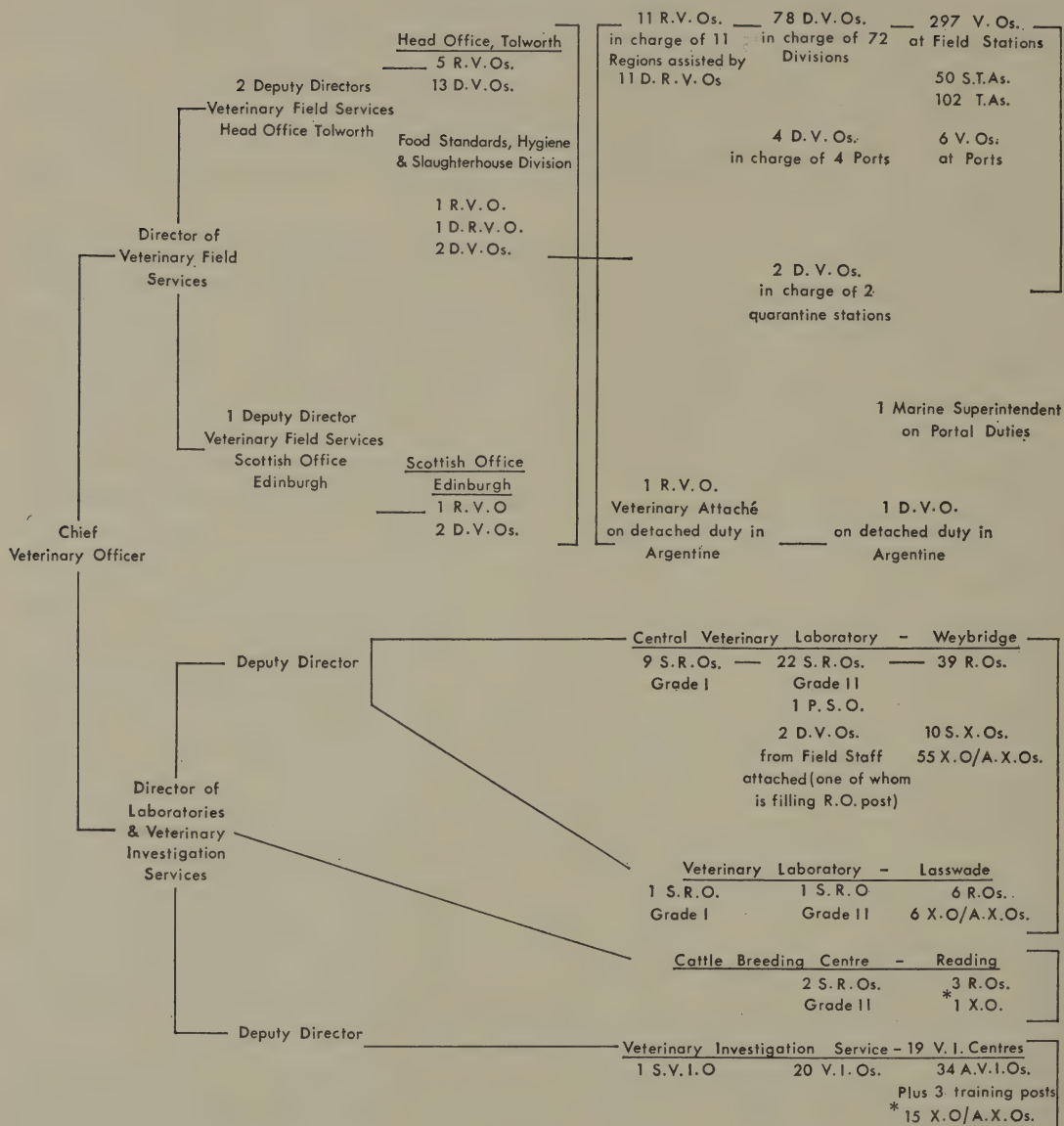
Veterinary staff should be well distributed throughout the country and this has usually been achieved by two means; by having whole-time staffs well deployed in every part of the country, and by using local practising veterinary surgeons as inspectors in a part-time capacity.

At the earliest stage only local authority staffs were available and very few of them were veterinarians, but gradually more travelling inspectors were used. Before the establishment of the Animal Health Division the Service was administered directly from a central office in London and the few whole-time government veterinarians in the various counties had no local offices but functioned from their own homes, and did so successfully because they only handled a few diseases. However, by this time, local authorities carried veterinary staff responsible for duties connected with milk and dairies legislation and meat inspection, and for work under Diseases of Animals Acts, mainly relating to tuberculosis in cattle but also to anthrax, sheep scab and parasitic mange. In 1938 the Animal Health Division of the Ministry of Agriculture and Fisheries assumed all the veterinary functions of the local authorities, except meat inspection, and the responsibility for the health of any stock owned by them. An area organisation was established with divisions in each area. Each divisional veterinary officer had an office with supporting clerical staff. More recently, with the reorganisation of the Ministry of Agriculture, Fisheries and Food into regions, the field organisation of the Animal Health Division has been adjusted to conform with regions and the whole-time staff is now deployed under regional and deputy regional veterinary officers in eight regions in England and Wales. In Scotland, in order to reflect a similar organisation, there are three regions which conveniently cover the territory of each agricultural college. In the regions there are offices for each divisional veterinary officer. This ensures a service throughout the whole of Great Britain and, since the RVO is usually stationed in the same town as other services in the Ministry or Department, there is every opportunity for close collaboration.

In addition, private veterinary surgeons are employed as local veterinary inspectors, mainly to carry out duties other than those connected with the highly diffusible diseases such as foot-and-mouth disease and fowl pest. LVIs have, indeed, borne the chief burden of tuberculin testing, calfhood vaccination against brucellosis and routine dairy herd inspections, but they also have other duties. The fees received have made it possible for a veterinary surgeon to carry on practice and provide a service to farmers in some areas where otherwise he would not have been able to make a living. In

THE ORGANISATION OF THE VETERINARY STAFF

Authorised Establishment at 31 December 1964



R.V.O. Regional Veterinary Officer
D.R.V.O. Deputy Regional Veterinary Officer
D.V.O. Divisional Veterinary Officer
S.V.I.O. Superintending Veterinary Investigation Officer
S.R.O. Senior Research Officer
R.O. Research Officer

S.X.O. Senior Experimental Officer
X.O. Experimental Officer
P.S.O. Principal Scientific Officer
S.T.A. Senior Technical Assistant
T.A. Technical Assistant
* Regional Responsibility

Scotland this is further ensured by the Highlands and Islands Veterinary Services Scheme which provides for payment to veterinary surgeons in private practice in crofting areas so that they may give a service to the crofters at a reasonable fee.

As the duties of the veterinary services have become diversified, more and more administrative and clerical support has been required in the regions and in the offices of the DVOs. Moreover, and further to relieve veterinary staffs of purely routine work, technical assistants have been appointed to carry out certain procedures in the field. They were first appointed in 1945 as 'lay poultry testers' to do the blood testing of poultry when the rapid whole-blood plate agglutination test carried out on the farm had been substituted for the tube test done in the laboratory. Gradually the scope of their duties has been increased to include supervision of disinfection of markets, railway sidings, railway trucks and road vehicles; the supervision of stores at local disease centres set up for the control of foot-and-mouth disease or fowl pest, and work on infected places; the distribution of vaccines for fowl pest and brucellosis, and, in general, those duties which do not require a qualified veterinary surgeon. Thus, there is again a part of the staff with no veterinary qualification carrying out work in the field concerned with diseases of animals. The present-day technical assistant, however, works under direct veterinary control and supervision.

It would be impossible to deal successfully with outbreaks of disease without the willing and efficient assistance of the police, who have a dual rôle. As police they accept notification of disease, and as inspectors appointed under the Diseases of Animals Act they help with individual outbreaks and do routine supervisory work on the general regulations, including the records of movement of stock and the boiling of swill. In some counties other inspectors are appointed. Since local authorities enforce the regulations these inspectors have many duties and they are particularly valuable when it is necessary to place movement restrictions upon several individual farms widely scattered over the country. DVOs can arrange for this to be done by the police, acting as inspectors, and it can be completed in a matter of hours.

The system of staff distribution and division of duties between whole-time and part-time veterinary staffs has been severely tested on several occasions since 1938. There have been repeated series of outbreaks of foot-and-mouth disease, particularly in 1937-38, 1940-42, 1944-45, 1951-52 and 1960-61, and continuing fowl pest since it was re-introduced in 1947. From 1938 to 1950 the final steps had to be taken to eradicate sheep scab. Since 1942 (1948 in Scotland) the routine testing of poultry-breeding flocks for pullorum disease, under official schemes, has been done in the field firstly by veterinary and later by technical staff. All these duties essentially concerned the whole-time staff. In addition, they and local veterinary inspectors had to deal with outbreaks of anthrax and swine fever. When the area plan for the eradication of bovine tuberculosis was started in 1950 only 20 per cent of cattle were in attested herds, so

that some 8 million cattle were included in the herds brought to attested standard by the process of repeated tuberculin testing between 1950 and 1960. Whole-time staff had to do at least one test in each herd immediately before the herd was classed as attested. Routine inspections of dairy herds had also to be maintained and those clinical cases of tuberculosis found or suspected had to be dealt with: there was an average of nearly 12,000 a year from 1938 to 1950 and of under 2,000 from 1950 to 1960.

With foot-and-mouth disease or fowl pest, re-deployment of whole-time staff is necessary to meet a local situation and to man the temporary disease-control centre which is set up. During the course of major outbreaks of disease many veterinary officers have to work away from their permanent stations; on one occasion 235 from a total of 285 were absent from their home divisions. Temporary veterinary inspectors are also employed. During periods of major epidemics whole-time officers virtually take no part in the less urgent duties, yet it is remarkable how infrequently any substantial delay in the timing of routine tuberculin tests occurs. This work falls almost exclusively on LVIs who are not moved from their home area as, indeed, they cannot be taken away from their practices. Moreover, the duties of TVIs, who at one time worked only on foot-and-mouth disease and fowl pest, now include tuberculin testing, and it is remarkable how quickly a small mobile cadre of such men, with no other work to do, can restore a situation where tuberculin testing has perforce fallen into arrears.

It will be realised that a very serious disease situation could develop because of insufficient veterinary staff. Even as late as 1920-23 every available veterinary surgeon had to be used in an endeavour to cope with foot-and-mouth disease in Cheshire and several other counties. Although there was then far less routine work, there were too few whole-time officers to deal adequately with the initial outbreaks and with the numerous secondary centres of infection which developed.

In the organisation of the Animal Health Division there are at least seven important elements.

1. The veterinary staff is common to the whole of Great Britain thus ensuring uniform disease control measures which may be systematically applied throughout the whole of the area over which livestock moves freely. It incidentally provides a better career prospect for the staff.

2. The provision of research facilities within the Division and the existence of the Veterinary Investigation Service, in addition to the field staff, provides for all aspects of disease control. It divides the work into manageable departments which, however, collaborate closely and are all under the general control of the Chief Veterinary Officer.

3. The employment of veterinary surgeons in practice as part-time inspectors provides a veterinary staff which bears some relationship to the local stock populations and assists in maintaining a service of private veterinary surgeons in the more remote, less heavily populated, parts of the country.

4. The deployment of whole-time field staff in regions and in divisions (roughly counties)

provides an adequate geographical distribution and the regional veterinary officer is in a position to co-ordinate all the work of the veterinary staff in his region.

5. The good relationship between the administrative and the veterinary staff is an outstanding feature of this organisation. Each has an important specialised rôle, but their duties are complementary; the combination can only have its full effect when there is mutual respect and an appreciation of the differing problems.

6. The assistance given by local authority organisations, particularly the police, is indispensable. Police constables, as such, accept notification of suspected disease. Inspectors under the Diseases of Animals Acts, who in most cases are members of the police force, have important duties in connection with general disease of animals legislation and with regulations dealing with notifiable diseases.

7. Other lay staff, technical assistants, available for a number of wholly routine duties in the field, relieve the veterinary staff and allow their attention to be given to more strictly veterinary matters.

The field staff are supported by officers of the Veterinary Investigation Service. This is essentially a local laboratory service whose duties are mainly to provide a diagnostic service to veterinary surgeons in practice, and to deal through them with the investigation of disease problems which seem to demand an approach on a herd basis, and which may possibly be beyond the resources of a private veterinary surgeon. The VIOS collaborate with the field service in disease surveys and are available to assist in diagnosis of disease in all animals, but notably in poultry. They may bring to the notice of the central laboratories problems requiring more fundamental study than is possible at a veterinary investigation centre.

The laboratories at Weybridge and Lasswade play their part by providing the final diagnosis in all notifiable diseases, except foot-and-mouth disease which, for reasons of disease security, is diagnosed at the Animal Virus Research Institute at Pirbright, Surrey, where, through the good offices of the Director, a very rapid diagnostic service is available. Also, the laboratories manufacture the biological products which are required for the control of notifiable diseases and for disease-control schemes. Thus the central laboratories have produced all the tuberculin, the S.19 vaccine against brucellosis, the crystal violet vaccine against swine fever, the stained antigen for pullorum disease and many other minor items. A vaccine developed at the laboratories may be supplied pending production by a commercial firm; such a vaccine was produced for duck virus hepatitis.

The central laboratories play a large part in research into animal diseases in Great Britain but essentially they concern themselves with the notifiable diseases, other than foot-and-mouth disease, and with any disease which seems to constitute a serious economic or public health problem. This may involve long term research, as with mastitis or Johne's disease, or it may be urgent *ad hoc* work to meet a disease problem which has been unexpectedly encountered. It is essential that the laboratories should be prepared to

accept responsibility for this sort of work at short notice, and it must be appreciated that such disturbance of the even flow of research is a considerable burden to the workers and interrupts the planned research programme.

When the field service was organised under the Diseases of Animals Branch of the Ministry of Agriculture and Fisheries in 1919, veterinary officers were required, within two years of their joining the Service, to pass an examination to test their general knowledge of infectious diseases and the regulations dealing with diseases of animals. This test is no longer applied but staff training is not neglected. Short courses on general or special subjects are conducted at the laboratories for field staff including TAs. Assistant VIOs on first appointment spend a full year at Weybridge before being posted to an investigation centre. Selected men from this service and from the laboratories are encouraged to take up various post-graduate studies, perhaps under scholarships, at home or abroad. More formal courses for VIOs have been recommended and six VOs take the course and examination for the Diploma in Veterinary State Medicine in Edinburgh each year.

In order to keep whole-time and part-time veterinary staff abreast of activities of the Division the *State Veterinary Journal*, founded in 1945, is published thrice yearly. Certain organisations at home and abroad are sent copies which are usually placed in their libraries. Practically all its copy is produced by members of the whole-time staff, but informative articles by other writers are included, for example explaining and describing organisations of close interest to the Division or detailing work done elsewhere on a disease of particular concern.

REGULATIONS FOR DISEASE CONTROL

Besides an efficient organisation, it is obviously essential to have a basic knowledge of disease and a sound understanding of methods of control, and here the Central Laboratories and the Veterinary Investigation Service are invaluable. Control methods used in the field must continually be reviewed and revised in the light of experience; and, so that this may be done, it is essential to keep the field work under constant study, to regard it as operational research and to co-ordinate the results at headquarters.

Over the years an efficient method of dealing with notifiable diseases has been evolved. Comprehensive instructions define the duties and outline the procedure to be followed in various circumstances in order to implement the numerous Acts and Orders. Regulations are continually under review and are altered to meet changing conditions. A regulation requiring dried milk to be used for feeding calves in transit was introduced because the foot-and-mouth disease virus had been conveyed to calves being fed as a routine on milk at Crewe railway junction. The Record of Movements Order, which requires farmers to keep a record of the movement of animals on to and off farms, the Diseases of Animals (Waste Foods) Order, and the Transit of Animals Orders (so far as

they relate to disease prevention), are all examples of regulations made as a result of obvious needs disclosed in the course of the application of disease-control measures in the field. They are regulations which have general application and do not refer to any one disease.

There are also general regulations which deal with disinfection and the standards of disinfectants. The risks of conveying infection through the medium of railway trucks and road vehicles are reduced by a general regulation which requires the disinfection of the vehicle after each use. It was as a result of research work at Pirbright that washing soda came to be used for disinfection in outbreaks of foot-and-mouth disease. It has also been used for cleaning premises in connection with other diseases. Even if it is not very effective against the particular infective agent it is of real value in cleaning the buildings and it has come to be appreciated that this is a very important consideration in eliminating infection.

A very important regulation concerns the boiling of waste food products before they are used for feeding animals. This is of interest not only because it minimises the chance of introducing fresh infections from abroad but because it helps to prevent the spread of diseases that exist at home. The problem has been a continuing one for the veterinary service and has been studied by various departmental committees in relation to swine fever, foot-and-mouth disease and fowl pest. Inevitably there is waste food, and one method of utilising it is to make it available for feeding to animals, particularly pigs and poultry. If all waste food were collected and processed centrally, no doubt the material would be safe before being brought into contact with animals. This is normally impracticable because waste material originates from individual households, including those in rural areas as well as from institutes, hospitals and hotels. It was done, however, to some extent during the Second World War. Extreme shortage of feedingstuffs, and the need to make everything possible available for animal feeding, enabled central processing plants to sell their product at an economic rate. This is no longer so and this system has largely gone into disuse. At the other extreme there are advocates of a complete ban on the use of waste food products for animal feeding, but this disregards the known risks that arise from material to which stock may have direct access because the dump is unfenced or which birds, foxes and rats may carry to fields where stock is grazing. Indeed it is a normal practice in many rural areas to inspect rubbish dumps to ensure as far as possible that the material is covered and that they are properly fenced against livestock. Whatever may be done to reduce the dangers from swill there will always be the problem of kitchen waste from the farm house or farm cottage. This may be dangerous if it is carelessly thrown to the stock or if stock is allowed to make contact with it. It is because of the serious risk that arises from garbage-feeding that the normal practice nowadays, when applying the stamping-out policy for foot-and-mouth disease, swine fever and fowl pest, is not to

salvage any of the material for food but to destroy the carcasses of all affected and apparently healthy in-contact animals.

The importance of the control of movement of animals cannot be over-emphasised. There is ample evidence that where it is possible to prevent unnecessary movement, spread of disease can be very largely controlled. This is one of the major contributions to the successful application of the stamping-out policy for foot-and-mouth disease. Indeed, it was the good effect on the incidence of that disease which resulted from movement controls imposed to deal with rinderpest that encouraged the authorities of the day to tackle foot-and-mouth disease. In more recent years it has been noted that the incidence of swine fever rapidly diminishes in areas under movement control for foot-and-mouth disease. On those occasions when the application of area movement controls is justified in connection with swine fever itself, the incidence is similarly reduced. It is not only a question of preventing movements between farms but, much more particularly, prohibiting the aggregation of stock in markets, fairs or shows where infection is spread by close contact throughout a large number of animals which are then distributed over a wide area and may carry the infection with them.

PUBLICITY AND DISEASE CONTROL

It is never easy to ensure that farmers are aware of the regulations which are in force to control disease, or of the facilities which are available to them under disease-control schemes, and of the preventive measures and treatments that may be provided by their veterinary advisers as a result of research and investigations.

Attempts are made to help in a number of ways. A large selection of advisory leaflets describing notifiable diseases and other conditions of economic importance are published by the Ministry for stockmen. The leaflets give the essential features of the diseases and advice on how to deal with them by reporting the ones which are notifiable and by seeking assistance from the proper source for the others.

Topical subjects are also discussed in articles in the national and local Press, and by radio and television. Indeed, episodes in farming radio serial programmes such as *The Archers* have dealt with animal diseases in an acceptable manner and with benefit to the industry. The Ministry's journal *Agriculture* is also a valuable medium. Members of the staff, particularly VIOS, frequently address meetings of farmers' organisations and young farmers' clubs.

Exhibits at national and local agricultural shows are produced by the Ministry's Information and Investigation Division which is advised by a committee on which there is a representative from the Animal Health Division. The opportunity to reach a wide agricultural audience on these occasions is of real value in publicising disease control schemes and the diverse methods of disease prevention.

The most fruitful publicity is coincidental discussion between the farmer and the

well-informed veterinary surgeon who has occasion to visit his farm. Most veterinary surgeons in agricultural practice are LVIs and, as such, receive a book of instructions, and circulars for keeping it up-to-date, about the notifiable diseases. They also keep themselves informed by articles in veterinary periodicals including the *State Veterinary Journal* to which contributions are made by veterinary investigation officers and field staff. This channelling of information to veterinary surgeons, so essential if the farmer is to be kept fully acquainted, is not difficult.

All these methods are valuable in bringing new schemes or procedures to the notice of farmers and in explaining the way they work. They describe the farmer's responsibility and the benefits he and, indeed, the whole agricultural industry may derive from them. Nevertheless it is still true that only a proportion of stock-owners practise even the well-known methods of disease prevention.

This may happen because the results of research and investigation are not published sufficiently widely, or because the methods of control are not fully understood or their value appreciated, or even, perhaps, because they are simply ignored.

In any event efforts are now being made to remedy the situation. It was agreed in the White Paper on the Annual Review of Determination of Guarantees 1964 that a study group should be set up with the farmers' unions to consider ways and means of encouraging the application on the farm of the results of veterinary research. The initial meetings of this group have already taken place. Local study groups will be set up because seasonable advice can only be given with full knowledge of local conditions of climate, terrain, husbandry practices, disease incidence and many other variable factors. Efforts will be made by these groups to keep farmers on the alert about diseases. They will remind them periodically of the need to report symptoms suspicious of notifiable diseases in their animals, and to vaccinate against fowl pest, and they will recommend to them the facilities and value of control schemes such as the Calf Vaccination Service against brucellosis. They will draw their attention at the right times of the year to the need for dipping or dressing against warble fly. They will discuss the advantages of such simple practices as de-horning, and they will provide information on the use of a variety of vaccines for preventive treatments depending on local conditions. In general the groups will keep farmers advised on all available opportunities for disease prevention and for the establishment and maintenance of healthy and profitable herds and flocks.

ASPECTS OF ERADICATION AND CONTROL OF DISEASE

In dealing with the control of an animal disease it is always worth while to consider whether it may be eradicated. Only one disease of animals, vesicular exanthema, has been completely eliminated from the world. This condition was confined to pigs; clinically it closely resembled foot-and-mouth disease, but was caused by a distinct

virus. It was declared eradicated from the USA in October 1959 and, as it has never been recorded elsewhere, it may well be claimed that it has been eradicated entirely.

Many animal diseases have been cleared from Britain and from other countries. Rinderpest, contagious bovine pleuro-pneumonia, sheep-pox, rabies, glanders, parasitic mange of horses and sheep scab have disappeared from Great Britain and their re-introduction has been prevented by very strict measures controlling the importation of animals and animal products.

Official action is obviously needed to complete eradication. It will only be taken if the disease is a killer, or if it has serious effects on the agricultural economy by spreading rapidly, or if it is an insidious disease of high incidence, or if it affects human health. Efforts may be justified of course in attempting to stamp out any disease which has been recently introduced because prompt and vigorous action at this stage may well succeed even with a disease which would not otherwise be tackled in this way. This was attempted, for instance, when atrophic rhinitis was introduced with imported swine but abandoned when it transpired that a form of the disease was already present in the country.

There are many difficulties that interfere with complete eradication and the attempt must not be lightly undertaken. Consideration must be given to the type of territory and the methods of husbandry; the question of reservoirs of infection in other species or in wild life, in imported animals or material, or in carcasses kept in cold store, and the cost in relation to the savings which may result. These questions are discussed in the following pages.

Terrain and Husbandry

Contagious bovine pleuro-pneumonia was eradicated from Great Britain in 1898. At the time there was little precise knowledge of the disease for its cause was only discovered later that year by French workers. The control measures were based entirely on knowledge gained in the field. Now that diagnostic laboratory tests and vaccines are available it might be expected that the disease could be eradicated without much difficulty for it does not spread rapidly. However, it is still present in a number of countries, for example, in a part of Australia where the cattle are at free range in vast tracts of rough territory and are very difficult to handle for tests or vaccination. Sheep scab is still a problem in some countries or areas in which the type of terrain makes it troublesome to round up the sheep for regular dipping or to control their movement. In Britain it was difficult to ensure that all the sheep were gathered from a hill on each occasion for dipping and it was only persistent, regular and repeated dippings that brought success.

With poultry there are special problems of husbandry which interfere with the eradication of a highly infectious disease. It is very difficult to control movement of

poultry. Infection may be spread by carcasses, eggs and feathers. Crates may become contaminated and thereby readily convey infection between farms, markets and slaughterhouses. Dealers and poultry slaughterers habitually visit farms to purchase birds or to cull flocks for birds to slaughter, and in the course of handling the stock may thus spread disease. With intensive husbandry when large concentrations of birds become affected with a diffusible virus a very heavy weight of infection may be spread through the atmosphere, especially with forced ventilation from the poultry houses, and may reach contiguous flocks. It is therefore a hazardous undertaking to attempt radical elimination of a highly infectious disease of poultry. It was the increasing development of larger flocks and intensive methods in Great Britain that made the stamping-out policy for fowl pest much too costly and demonstrated that there was no prospect of final eradication.

Wild-life Reservoirs of Infection

Fowl pest was spread by sea-birds in north and west Scotland. Not only was there some evidence of these birds carrying disease mechanically in materials which they had been scavenging, but cormorants and gannets evidently did become affected and were capable of transferring infection. Cormorants were used for food by some of the islanders and apparently infection was spread to domestic poultry by the discarded offals.

Rinderpest is the great killer disease of cattle. Excellent vaccines are available for its control but it is still difficult to eradicate. Pigs, which are not normally affected by the virus, may play some part in its dissemination and wild ungulates may be a reservoir of infection for domestic species with which they come in contact. Similarly, in many countries wild ruminants maintain a reservoir of foot-and-mouth disease for it must always be remembered that all cloven-hoofed animals are susceptible to some degree and that all the cloven-hoofed farm animals must be included in the application of control measures.

Rabies is another disease which is perpetuated by wild species such as foxes, wolves and skunks in North America and jackals and the mongoose tribe in Asia and Africa. The virus is not necessarily fatal to the skunk which may therefore become a symptomless carrier and a continuing source of virus infection for animals with which it comes into contact. Bats may carry the virus and in some countries blood-lapping vampire bats and even fruit-eating species may be responsible for carrying infection to farm animals and to man.

The wart hog harbours the virus of African swine fever and is capable of spreading infection to domestic pigs unless they are kept under such control that contact with the wart hog is avoided. This is done in Kenya by housing the domestic pigs and fencing them against contact with the wild species.

Wild species may play a part in the spread of such diseases as leptospirosis, African horse sickness, malignant catarrh and psittacosis.

In Great Britain wild animals are not a serious reservoir of infection although there are numerous records of the discovery of pathogenic organisms in them. In 1946, hedgehogs which had apparently carried infection from one farm to others were found to have lesions of foot-and-mouth disease. There is, however, no evidence that the virus is harboured in hedgehogs nor in any other wild animal. Species of *Leptospira* (*icterohaemorrhagiae* and *canicola*) are common in rats which are a reservoir of infection for man, dogs and other animals; psittacosis virus is found in wild birds, especially pigeons, which may be apparently healthy until a population explosion or shortage of food precipitates a crisis; the part played by wild birds in the spread of Newcastle disease has already been mentioned, and it is known that foxes and rabbits are concerned in the life-cycle of certain tapeworms which pass another stage, adult or intermediate, in domestic animals.

Wild animals and birds may help to spread disease simply by mechanical transfer of infective material. Viral, bacterial and parasitic diseases may be spread in this way. For instance, circumstantial evidence incriminates birds and rats in the spread of foot-and-mouth disease virus; foxes have been concerned in the spread of brucellosis by carrying infected material between farms; seagulls carry the eggs of *Taenia saginata*, a tapeworm of man, from the sewage effluent in which they scavenge, to pastures where cattle become infected with cysticerci, the intermediate stage of the tapeworm.

Enough has been written to show that it is necessary to study the possibility that wild animals or birds may be involved in the disease of domestic animals and that they may have to be considered in devising control methods. If they are known to be susceptible to infection efforts must be made to prevent contact between them and farm animals, as with foot-and-mouth disease in relation to herds of deer. When practising disease control measures the mechanical transfer of infection must be prevented by rapid disposal of infective material, by ensuring that foodstuffs that might attract birds and vermin are not exposed and by effective means of vermin control.

Importation Risks and Policy

Disease in wild animals also influences the regulation of imports of animals. When wild life is known to be a reservoir of infection in a particular country domestic animals from that country may not be acceptable, or if they are accepted great care must be exercised. This particularly applies to such diseases as rabies and rinderpest. Ruminants imported for zoological collections must be carefully screened in the country of origin and then quarantined after arrival in an urban zoo for a long period (in practice a year) before being allowed to move to a rural zoo. Birds of the parrot family are only imported under licence and in small numbers to destinations remote from con-

tact with domestic birds. Many are still imported but, because the number in each consignment is restricted, there is much less opportunity for disease to spread during transit, and so it is but rarely encountered.

A constant guard must be maintained against the introduction of diseases which have been or are being eliminated from this country, as well as those which have never appeared. It is obvious that if decisions about importation depended only upon animal health considerations much of the material of animal origin brought to Great Britain would not be acceptable. Patently other factors have to be taken into account. They include the overriding need to see that the populace is well fed. Questions of trade agreements must be looked at and there must be no unnecessary interference with trade. The quality, quantity and price of the product are important. For example, only Argentina is capable at present of providing high-quality beef in great quantity at a reasonable price. A degree of prudence must be exercised depending on the consequences which would attach to the introduction of a particular disease. Considerations must be given to the prospects and cost of eliminating it and how our own export trade may be affected. All this requires to be balanced against the need for the animals or materials, and, generally, no risk is accepted unless the importation is considered indispensable to achieve some particular aspect of breed improvement or to provide necessary supplies of a protein food.

It is unnecessary in this chapter to deal in detail with importation which is considered elsewhere. As a general principle, imports of animals and animal products are prohibited and exceptions are made only on the authority of specific legislation or under licence. Such an arrangement is much easier to administer than one where it is the prohibition which is exceptional. In some instances the authority to import is in statutory legislation, as for importation of livestock from Ireland, the Channel Islands and the Isle of Man, and of cattle from Canada. Similarly, in the schedules to the regulations dealing with carcasses, exemptions are made allowing imports from certain specific countries and of certain specified materials from any country.

Usually a visit is made to an exporting country to ensure that the disease position, the system of control and the methods of slaughter and processing meet normal health requirements. There is a further benefit. The conditions which are imposed can be fully explained and their practicability assessed on the spot. Indeed, the original requirements may be adjusted to simplify the task of the service in the exporting country while still remaining within safety limits, or additional precautions may be found to be practicable. No risk would be accepted to obtain a luxury product from abroad.

The main features about a disease which need to be appreciated, apart from its incidence and distribution, are methods of transmission, the period of survival of the infective agent away from the host, its existence in a latent form, and the possibility of a carrier state.

Moreover, certain diseases which have long been present in a country may, as a result of adaptation, have assumed mild characters which may make them less easily identifiable than the more acute types found elsewhere. A relatively mild disease of poultry, pneumo-encephalitis, which was present in the USA, was later recognised as a manifestation of Newcastle disease. Similarly, it was some time before a condition seen among sheep and known locally as 'sore muzzle' in the USA was identified as being the same as blue tongue. In India rinderpest may be a mild and more or less chronic disease with a low mortality. It was because of this that Belgium and France became infected with rinderpest in 1920 when a boat load of cattle *en route* from India to Brazil were off-loaded at Antwerp. Incidentally this episode had the far reaching effect that it eventually resulted in the establishment of the *Office International des Epizooties*.

Apart from animals from Canada, Ireland, the Channel Islands and the Isle of Man, livestock is only introduced for exceptional purposes. A general exception is made for pedigree animals from Commonwealth countries but for others it is necessary to establish the need for the animals, which is usually interpreted to mean that they may benefit the particular breed, or livestock as a whole, but not that the advantage is confined to an individual. To establish that these animals are required it is common practice to consult the farmers' unions, breed societies and other farming organisations. Similar considerations govern the importation of poultry and hatching eggs.

Animals are not accepted from countries affected with rinderpest or where the disease control arrangements are not well developed. Otherwise the safety precautions are devised to meet a particular situation and are defined for each importation.

Study of a particular disease may lead to decisions to import animals at a particular age. Because of the important part that apparently healthy sows may play in the spread of swine fever by maintaining virus which later causes disease in their piglets, it is wise to import gilts before they have been mated. The Canadian authorities when devising elaborate precautions against scrapie decided to import only sheep over four years old because the occurrence of the disease is so rare in animals of that age. Hatching eggs may be imported in place of birds so that any but egg-borne diseases are avoided and these are screened by hatching and rearing in quarantine. Similarly, an importation at a particular time of the year may be advisable, for example, outside the season when flies are numerous in the case of fly-borne diseases.

Because of the possibility of inapparent infections with foot-and-mouth disease, home-bred susceptible animals may be kept in close contact with the imported animals in the quarantine station so that they may act as indicators by showing overt evidence of disease. This may also have some value with other, less important diseases. This is indeed the usual practice in Great Britain.

Disease may be introduced because of faults in the methods of control of importations. The regulations may fail to take account of the risks from foreign meat

and meat products, or they may be improperly observed, or the officials at seaports or airports may act inefficiently and accept animals or materials which are prohibited or, indeed, these may be smuggled into the country. Infection may enter by unusual ways, for example, in an infected biological product, or perhaps in foodstuffs or clothing carried by immigrants. Disease may be set up by indirect means against which there is no possibility of protection. It may be insect-borne, or carried by wind or brought through scavenging or migrating birds.

That this is possible has been demonstrated far too frequently in recent years. Foot-and-mouth disease has appeared in Mexico, Canada and South-West Africa. On numerous occasions the disease has been transferred from one country to another through meat products or garbage. The USA, Great Britain, Greece, Portugal and Italy have all experienced this; and, regularly, massive infection in one country spills over to others—from western Europe to Britain and from Germany to Denmark by one indirect means or another. African type of foot-and-mouth disease virus has caused an outbreak in Great Britain by escape from a laboratory, and this is not unique. Another African type spread from Africa to Bahrein and thence to numerous countries, penetrating as far as Turkey and Greece. During the Second World War swine fever (hog cholera) was established in several countries in the wake of armies through their supplies of ham and pork. African swine fever has been established in Portugal, has spread to Spain and has caused several outbreaks in France. Blue tongue has once again broken from its boundaries in Africa and become established in Portugal and Spain. Newcastle disease has been disseminated from Asia, Europe and the USA until it has virtually a world-wide distribution except for Australia and New Zealand.

Recognition of Exotic Diseases

A good organisation and efficient diagnosis is needed if an exotic disease is to be recognised, but routine methods may be adequate on occasions. When SAT 2 foot-and-mouth disease virus caused an outbreak in Surrey it was handled in the accepted manner and it had been eliminated before it was known that an exotic virus was involved. A new disease or a disease which had been long absent from the country will not always be so readily recognised. No one on the present veterinary staff has, of course, experience in this country of rinderpest, pleuro-pneumonia, glanders and rabies, and an increasing number now have had very little experience of sheep scab and even of clinical tuberculosis in cattle.

It is therefore good practice to compile and maintain references to exotic diseases with a summary of the methods which may be applied if a particular disease should enter the country. The FAO/WHO/OIE *Animal Health Yearbook* has given valuable knowledge of the distribution throughout the world of many diseases and is used as a routine in building up a knowledge of the situation in other countries.

A number of officers in the Animal Health Division have had experience abroad of the diagnosis and control of exotic diseases. A register is kept of such men and of the diseases with which they are familiar. On occasion it has been helpful to bring one of them to examine animals under suspicion.

To reach a diagnosis, transmission experiments may have to be made, in which case they must be done under suitable conditions of isolation, but serological or other tests are usually available. It has sometimes been necessary to seek the assistance of laboratories abroad.

Economic Factors in Disease Control

In some countries the cattle may show less marked symptoms of an infectious disease than those seen in improved European breeds. This occurs with foot-and-mouth disease and rinderpest. In tropical countries disease may spread less readily than it does in colder climates because the virus is susceptible to heat or more particularly to sunlight. The cost of eradication, or even control, may therefore appear in such countries to be disproportionate to the losses unless the disease has some other indirect effect such as preventing the export of animal products. Conversely, certain diseases, such as anthrax, will spread much more rapidly in warmer climates than they do here. Such factors must be considered in deciding how a disease could be controlled or eradicated. In Great Britain anthrax is simply dealt with by disposing of the affected carcase and carrying out a minimum of disinfection on the infected place. It is uncommon to have more than one affected animal in an outbreak. Experience shows that infection is readily introduced in various imported foodstuffs and fertilisers, but the loss to agriculture by preventing these importations would be far greater than the economic effect produced by the few cases that arise from these sources. Where the infection appears to be present in soil, for example, in areas where effluent from tanneries contaminates rivers which may overflow and flood pasture, a good vaccine is available and is used to protect stock. On the other hand very much more attention is given in Great Britain to the elimination of foot-and-mouth disease, which spreads rapidly in temperate conditions, than is given to it in countries with warmer climates and more resistant cattle.

Warble fly could be eradicated by the proper application of dressings to infested cattle. Although the newer products may help, nevertheless it is extremely difficult to encourage or enforce the careful attention to dressing or treatment which is necessary, because the loss from this disease falls on the hide trade and not directly on the farmers who do not apparently appreciate that 'gadding' may affect production and reduce profit; nor is the harm done by migrating larvae realised.

Eradication by 'Stamping-Out'

It is not difficult to decide that a highly diffusible disease must be tackled in one way or another and it will be necessary in the interests of agriculture and the national economy

to impose a system of control leading to eradication or at least making it economically possible to live with the disease. Heavy expenditure may be justified over a short number of years if complete eradication can be achieved. A slaughter policy is bound to be costly and it is unlikely that it can be sustained for any goal short of eradication. Usually one would assume, therefore, that a slaughter policy made possible the elimination of the disease and that this was the expectation of those who had decided on this policy.

It is always essential to obtain the agreement of the veterinary profession and of farmers to such a policy because the meticulous disease control measures that have to be taken in the general interest may seriously affect the individual farmer. While adequate compensation may be paid for animals slaughtered there are still consequential losses. Trade is lost and labour costs continue while a farm is empty; stand-still or restriction of movement of livestock interfere with the disposal of stock which are ready for market; feedingstuffs may have to be purchased or transported to animals on pastures which can no longer support them; breeding arrangements are upset, and auctioneers' business is disrupted because markets are closed. All these and many other inconveniences will only be accepted by farmers if they are made fully aware of the objects of the policy and kept informed of the progress of the campaign at every stage.

Generally it is accepted that if there is compulsory slaughter there must be compensation but that no payment should be made for an animal which dies.

The level of compensation is important and must be based on a valuation of the animal. This should be the price the animal would realise if offered for sale in a healthy state, and it should take account of pedigree and performance. Valuation may be difficult because it may have to be decided for animals at stages of production when they are not normally sent to market. It is best to employ professional valuers.

If compensation is too generous there is no incentive for the farmer to take normal precautions against the disease; if it is too low it discourages reporting. Great care is therefore needed in arranging and negotiating the system of compensation.

Animals slaughtered on account of a disease which has a low mortality rate, or as healthy animals in contact with affected ones, are dealt with on a different scale from those affected with a fatal disease. Thus, it has been the practice with foot-and-mouth disease to pay the full market value for all animals slaughtered. With swine fever, on the other hand, half price is paid for diseased pigs, and with fowl pest no compensation is paid for affected birds. Clinical cases of tuberculosis used to attract compensation on a scale which depended on post-mortem findings. Since the introduction of the Tuberculosis (Compensation) Order 1964 they are now dealt with in exactly the same manner as are reactors to tuberculin. Reactors and affected animals are valued before slaughter as if they were healthy; strictly they have no market value because they

cannot be sold and admitted to another herd. They attract compensation at the rate of three-quarters of their value subject to an upper limit of £120 but full value, subject to no upper limit, is paid for animals slaughtered as contacts to reactors.

When it is necessary to resort to tests such as tuberculin or agglutination tests, eradication becomes a long and cumbersome process requiring very detailed organisation. This type of procedure must have prior acceptance by farmers for the long programme may cause interference with trading in addition to the actual disturbance of farm routines by repeated testing. It is therefore necessary to demonstrate that it is likely to bring lasting advantages before it can be adopted.

Glanders was eradicated by the application of the mallein test to horses but only with the prior consent of the owners. Bovine tuberculosis has been brought to the stage when only some seven animals from every 10,000 tested have to be removed as reactors. When the campaign started in 1935 it was calculated that some 40 per cent of cows or about 20 per cent of all cattle would react to the test. In such a situation eradication had to be a slow process if there was not to be serious interference with meat and milk supplies. In the event the programme was interrupted by the Second World War and so prolonged, but it is arguable that the improvements effected in the tuberculin test during this period of inactivity may have offset the effects of delay. This scheme of eradication was readily accepted by farmers and is an excellent example of a great co-operative effort between government departments, the veterinary profession and the farming community.

Other diseases which might possibly be considered for the same broad treatment are brucellosis and Johne's disease. Both have a high incidence of infection and a much lower level of clinical disease which makes identification of animals in the pre-clinical or latent stage of infection a necessity in order to develop methods of eradication. Despite this superficial similarity the diseases pose entirely separate problems.

The incidence of contagious abortion was at one time extremely high and certainly any effort to eliminate it from cattle at the same time as tuberculosis would have been an impossible task; firstly because herds would have been too heavily depleted by the removal of reactors to tests for both diseases; further, because rules would have had to be devised for herds free of one or both or neither disease, and these would have been too complicated to be comprehended by many of those concerned and, finally, because it is doubtful if a sufficient veterinary staff was available. Vaccination was therefore introduced to remove the greatest cost to the farmer and to the country, represented by loss of calves and abortions. This, vaccination has largely achieved. The S.19 vaccine induces reaction to the agglutination test but fortunately animals do not continue to react after about the age of eighteen months if they are inoculated in calfhood. It is now most important to discourage adult vaccination and to confine vaccination to animals at the optimum age which combines high enduring immunity with the early

disappearance of the agglutinins produced by the vaccine. This is why, in the scheme launched in May 1962, vaccination is confined to calves.

In Great Britain *Br. abortus* is the only species of brucella which has been identified among farm livestock and it is confined to cattle. Eradication of infection from cattle would destroy the source of human infection and undulant fever of man would rapidly disappear. There is no evidence that man is a source of infection to cattle. An eradication programme has, therefore, good prospects of success in that no reservoir of infection from which they may become infected is likely to remain after brucellosis is eliminated from cattle. This in turn encourages a time-table for eradication much more brief than for tuberculosis. With tuberculosis there were reservoirs of infection in other farm animals and in man. These could have been more troublesome after disease had been eradicated from cattle, but they largely disappeared in parallel with the progressive removal of infection from that species. Even now, bovine-type tuberculosis has not completely disappeared from the human population. Some people who were infected before eradication was completed still survive to reinfect cattle. There is also, of course, a minor risk of this type of infection in immigrants.

Apart, therefore, from the interference which may arise from cattle vaccinated against brucellosis as adults, the position has been reached where radical means to eliminate the infection from cattle must be considered. It will not be an easy task, largely because of the burdensome mechanics of testing the cattle and because of the movement restrictions which must be applied. Reacting animals will have to be removed from herds in which active disease is not apparent. However, if veterinary and farming interests are content to accept the situation it may well be that the expense of eradication, including compensation for slaughtered reactors, would be justified.

With Johne's disease a sufficiently reliable test has not yet been devised to justify a test-and-slaughter policy. There is no evidence of infection in man. Cattle and sheep are infected with equal facility. In these circumstances it has been decided to release vaccine for use in heavily infected herds. A good diagnostic test must, however, still be sought, because, apart from its eventual application in an eradication scheme, it would be of great value for animals being exported to countries which require them to be submitted to tests for this disease.

Progress towards Eradication

Before radical methods are justified either epidemiologically or economically it may be necessary to reduce the incidence or limit the distribution of a disease. One specific method is vaccination which has been used in official schemes in Great Britain, notably S.19 vaccine against brucellosis. For swine fever the Registered Vaccinated Herds Scheme fostered the use of crystal violet vaccine and was intended for the protection of breeding herds and of store pigs. It was not considered

that vaccination would either lead to eradication or, indeed, to such a degree of control as would allow the farming community to live with the disease. In both instances vaccination was considered to be but a step towards radical methods of elimination of the disease. While vaccination may be of great value in controlling a disease it is unlikely to eliminate it, and it is therefore necessary for farmers to appreciate that it is usually capable only of reducing the losses which arise from disease, although it may be the precursor of a more definite eradication scheme.

The comments of the European Commission for the Control of Foot-and-Mouth Disease are worth quoting in full in this context for they show the sort of considerations that have to be weighed.

In those countries where a heavy weight of infection is present or where there is a continued threat of infection, the policy should be systematic vaccination. The system may vary in accordance with the circumstances in the particular country. It may be possible for example, to adopt annual vaccination of all cattle stock in the country, or vaccination may be done around foci of infection or in threatened areas. When the number of outbreaks has been sufficiently reduced, vaccination may be supplemented by slaughter of animals on infected premises. Later, there may be a reduction in routine vaccination and the stamping-out policy may be adopted as the main method of control. This stage may not be reached in a particular country until its neighbours and countries from which imports, particularly of livestock, are made have reached a similar position. Only after this stage will it be possible to rely entirely on a stamping-out policy.

It is obvious that sufficient supplies of trustworthy vaccines must be available and that there is a staff capable of organising and carrying out the vaccination. It must be emphasised that, whatever the policy, it is essential to control the movement of stock, to dispose of infected material and to carry out effective disinfection.

The Committee was impressed with the success of the vaccination policy in those countries where it has been systematically applied. Not only has the number of outbreaks been reduced, but the weight of infection has been minimised, because as a general rule, only young cattle and pigs have succumbed to infection.

In order to have a stamping-out policy, the following points must receive careful application:

1. Early notification of a suspicion of the presence of the disease must be available.
2. A very meticulous system of dealing with such reports must be in force and must be readily put into effect—the system must include rapid diagnosis—immediate control of movement of stock over an area—immediate quarantine of the suspected or infected farm—tracing of all contact animals and slaughter of direct contacts on other farms, e.g. animals recently moved off the infected place and animals handled by the owner of the infected place or his veterinary surgeon after contact with infection.
3. Rapid means of slaughter and disposal of carcasses on the infected place.
4. An organisation capable of dealing with all the detailed tracing of stock which is necessary.
5. A system of recording movements of stock must be permanently in force and enforced to allow of easy tracing of animals.
6. Visits to examine stock in the vicinity of outbreaks must be made to discover secondary

outbreaks as early as possible and also to discover whether the first reported case is in fact the primary one.

7. There must be considerable elasticity in financial arrangements to allow of vigorous pursuit of the policy.

8. The farming community must be willing to co-operate in every aspect of the work.

In most European countries a stamping-out policy, not supplemented by vaccination, is impracticable, but the Committee regards a stamping-out policy as the ultimate objective.

The recommendation that there should be routine inspections of stock in the vicinity of outbreaks has been criticised because there is a danger that disease may be carried between one farm and another. Certainly great care must be taken with personal disinfection and, of course, if disease is found by an inspector he will make no further calls but will assume duty on the infected place. This emphasises the need for precautions to prevent the carriage of infection by veterinary surgeons generally. Not only must clothing, boots and hands be cleansed and disinfected but it is equally important that equipment is sterilized. There are records of conveyance of swine fever infection by contaminated needles and the establishment of tuberculosis in the udder by unsterilized teat syphons.

For a successful eradication programme several principles have to be followed, some of which are included above. A good method of diagnosis is essential, either by unequivocal symptoms which may be confirmed by laboratory tests, or by a test which is applied to the animals in life. By some means the infection has to be eliminated from the farm. The affected animals and their contacts may have to be slaughtered, but it may not always be essential to slaughter all the animals on the farm; that will depend on the nature of the disease. With foot-and-mouth disease, for example, all animals are slaughtered because it is necessary to stamp out the source of virus in the affected animal at once, and so rapidly does the virus spread that all contact animals must be destroyed to prevent further manufacture of virus. At the other end of the scale it is possible to remove only the affected animals, although sometimes immediate contacts are also removed as in tuberculosis. Meantime, movement of animals on to and off the farm has to be stopped or restricted. In order that the restrictions may eventually be removed with safety there must be a method of deciding the point in time at which infection has been eliminated. This may be by check tests on the animals remaining alive or, if all the animals have been removed, by leaving the premises free of stock for a period and carrying out disinfection. The position is much more difficult when radical steps are not being taken to deal with diseased animals. With sheep scab it was sometimes difficult to decide when treatment by hand dressing of the obvious cases and dipping of the flock had removed all parasites at all stages of their development. When the control of swine fever depended on the isolation of a herd until the disease

had disappeared this problem was extremely difficult for there was no test that could be applied and not all affected animals show overt symptoms of swine fever. An arbitrary decision has to be accepted in such cases and it was the practice to remove the restrictions on the infected place fourteen days after all pigs had died or been slaughtered and disinfection had been done, or fifty-six days after the last case of swine fever had been found on the premises.

Depopulation will be fruitless unless healthy animals are available for replacements. This may mean simply that the animals are clinically healthy and come from an area free of disease, as in foot-and-mouth disease, or that they have passed the necessary tests for freedom in a healthy milieu, as in tuberculosis. This is a consideration that must be given very great weight. It contributed to the decision to stop a slaughter policy for atrophic rhinitis for it was extremely difficult to ensure that the farm providing replacements was free of disease; it was among the points kept under review while a slaughter policy was maintained for fowl pest, but the very small number of recrudescences of disease on depopulated farms after re-stocking does not suggest it was a serious practical issue. It was particularly worthy of notice in the early stages of the eradication plan for swine fever because, in the course of re-stocking a farm, purchase of a few pigs from each of many sources was dangerous with a disease having such a long incubation period, and it was much more so when the local incidence was high.

It is essential that official control regulations are simple and readily understood by the farming community. The test of good regulations is that they are observed. Complicated systems are therefore to be avoided and no interference with farm operations or trading in livestock is justified unless it is clear and evident that without it the disease could not be controlled.

It has already been said that farmers' organisations must be consulted and kept informed about the purpose of what may appear to be interference with the farmer's freedom of action. Equally veterinary surgeons must be taken into consultation so that they are convinced of the value of any official duties they may have to do.

If restrictions are unpopular they come to be disregarded and therefore valueless. This is well represented by the swine fever movement controls which at one time were not enforced by local authorities and were resented by farmers although they were necessary for the control of the disease. Similar situations arose with warble fly and fowl pest. More recently the tattooing of the caudal fold, for identifying calves under the brucellosis Free Calf Vaccination Service, came into disrepute with the veterinary profession in spite of prior collaboration with the BVA in small-scale trials, and this method of identification has had to be replaced by another more attractive to the profession and to the farmer.

Methods used for disease control must therefore be carefully considered not only to judge their theoretical value but tested and tried for their practicability and for their

simplicity so that they may readily be comprehended. Regulations will not be well understood if they are continually amended, and only good, well-thought-out requirements will deserve to continue unaltered.

SELECTION OF DISEASES FOR OFFICIAL CONTROL

In recent years surveys have been carried out to reveal the true situation of diseases in general, and of particular disease conditions amongst the various species. In a survey on wastage and husbandry in the British dairy herd it became clear that mastitis is still a very serious disease problem, and for the first time there was confirmation of the impression that foul-of-the-foot in cattle was having a serious adverse effect on the health of the dairy herd. The relative losses from mastitis and Johne's disease were of interest since it was shown that, although the incidence of the latter disease was much lower, the financial loss from Johne's disease was closely comparable with that from mastitis, because the Johne's diseased animal had no salvage value. Another interesting feature of this report was that it showed a measurable difference in breed susceptibility to certain disease conditions. The finding that the Channel Island breeds were more prone to become clinical cases of Johne's disease was incidentally confirmed in the course of experiments on this disease at Weybridge. Similar but less extensive surveys have been made in connection with diseases of calves, pigs and sheep, and more specific disease surveys into atrophic rhinitis of pigs and losses in the British dairy herd through brucellosis.

These surveys confirm some impressions that have long been held, and correct others. If repeated, the general surveys will show trends in disease and the more meticulous surveys on individual diseases help to decide whether it is economic to spend public money on further research or on their control.

The responsibility for all the diseases not subject to legislative control rests with the practising veterinary surgeon who has to do all the important day-to-day veterinary work on the farm. All that can be done is to provide facilities to help the practitioners with diagnosis and with information based on the results of general research or experience. VIOS provide these facilities and are available on request for consultation.

There are, of course, diseases which meet many of the criteria which have been suggested as qualifying them for official control which must, nevertheless, be left with the private veterinary surgeon. Salmonellosis of cattle is certainly widespread and has obvious public health significance, yet it is not a condition which lends itself to official control. If the condition were made notifiable it would be impracticable to apply a rewarding method of control or elimination. A number of animals will remain as carriers after any known form of treatment has been carried out in the herd; and for the same reason it would be wasteful to consider the slaughter of affected animals as this would only touch the edge of the reservoir of infection and it would be extremely difficult to

obtain replacement animals that were known to be free of infection. There are also many other sources of infection besides cattle. The disease in calves is rather a different proposition but with present knowledge it is inadvisable to take any specific official action against it since practices of good hygiene during transport, and in marketing and in lairages before slaughter are, by implication, required by existing general legislation.

Mastitis, which is one of the costly diseases of dairy cattle, and was one of the four diseases in the Panel Scheme, must remain the responsibility of the practising veterinary surgeon, but nevertheless a great deal of research and investigation has been devoted to it through laboratory experiment, surveys and field trials.

It cannot be claimed that the Panel Scheme had very much influence on the national disease level, because too few herd owners took advantage of it. It did, however, serve to emphasise the value of the approach to disease on the basis of the herd as the unit rather than of the individual animal and, additionally, was of great benefit in arousing the attention of the veterinary profession in general to the serious problem of infertility, and the value of regular herd inspection and pregnancy diagnosis. With the advent of artificial insemination this was still further exploited, for, with the background of the knowledge that the bull was healthy and fertile, more direct attention could be paid to the investigation of infertility in the female.

It is perhaps through schemes of this nature, which are more general in their application, that the approach to animal health may be made in the future. At present, a health scheme for poultry has been formulated and discussed and it is only difficulties of finance and organisation that have prevented its introduction. Similarly, a health scheme for pigs awaits the outcome of the eradication policy for swine fever before it is introduced, and a scheme for sheep has reached the stage of discussion.

DEVELOPMENTS IN THE FUTURE

There are other fields which must be further developed by the veterinary profession in this country. There is a need for better control of food hygiene. The fact that the veterinary supervision of meat inspection is advisable has been emphasised in the Report of the Verdon Smith Committee, and from this it seems reasonable to add other duties in connection with foods of animal origin. Certainly the veterinary surgeon should not be committed to routine duties such as the examination of carcasses and offal in the slaughter hall, but his work should be concerned with the over-all supervision of meat inspection, including ante- and post-mortem inspection of animals. At the same time the whole process of production in the abattoir and afterwards can come within his ambit. The veterinary surgeon's training in pathology, microbiology and animal welfare uniquely qualifies him for these duties connected with the hygiene of foods and the general scope of his education fits him as well as anyone to deal with the construction and hygiene of slaughterhouses and food-processing plants.

There are many duties in connection with public health which may well be undertaken by teams of workers which should contain veterinary surgeons. Already there is close collaboration between the staffs of the Animal Health Division and the Public Health Laboratory Service in certain areas but at present this is left more or less to local arrangement. It would be an advantage if this was a recognised routine procedure.

Experience shows that it will always be necessary to maintain a sizable cadre of whole-time veterinary officers to deal with any major infectious disease that may be introduced or re-introduced to this country. The number of whole-time officers in every locality need not be sufficient to handle a serious situation as it arises in the area; it is better to augment the local staff temporarily. Gradually a smaller proportion of veterinary officers will have handled certain diseases, and deployment of staff has the advantage not only of ensuring that a few experienced men may be made available but also that the opportunity is taken to train as many others as possible.

The number of staff to be maintained will depend to a large extent on the amount of routine work which veterinary officers are required to perform; food hygiene and new health schemes for sheep, pigs and poultry have already been mentioned. However, it is unlikely that for any lengthy period veterinary officers will be committed to such time-consuming operations as those connected with the eradication of bovine tuberculosis, although, to an extent, this may apply to brucellosis.

It is evident that much will depend upon the direction taken by animal husbandry practices in the future. The tendency at present is for intensification not only with poultry, which is already well established, but with pigs, cattle and sheep. This would appear to be inevitable under present-day economic conditions. The experience with poultry suggests that similar problems will arise with other animals so that respiratory disease problems with cattle and sheep may well become much more serious when large numbers are maintained in close contact. For example, it would not have been possible to maintain cattle under intensive conditions in the presence of bovine tuberculosis because it would have spread rapidly through the population; and other respiratory disease conditions are likely to spread with even greater facility.

On the other hand there may be some reduction in parasitic diseases in animals maintained away from pasture. Whether this is so or not, it is clear that the problems of disease under intensive conditions must be closely studied and the veterinary surgeon must be ready to adapt himself to the new conditions with which he is faced in practice.

The change towards intensification simply serves to illustrate the need for an appreciation of the part played in epidemiology by varying conditions of husbandry, and the need for the veterinary profession to be prepared to advise on how husbandry practices should be modified to minimise disease.

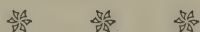
To the simplest forms of preventive medicine such as the de-horning of cattle,

tailing of lambs and de-beaking of poultry, must be added such routine preventive treatments and appropriate vaccinations as are necessary to limit the effects of husbandry practices which are inclined to encourage the spread of disease.

More attention must obviously be given to hygiene, nutrition and other fundamentals of management, and it will be necessary to ensure that the farmer is prepared to seek advice on the maintenance of health as well as on the prevention of disease.

The work of the Animal Health Division may therefore be increasingly directed through the Veterinary Investigation Service to provide diagnostic facilities and to act in a consultative capacity where necessary. Additional veterinary investigation centres are already planned and with field staff less occupied with major disease problems their efforts may be diverted in the same direction. Further integration between the field and investigation service is contemplated in new arrangements which envisage a regional investigation laboratory in each region of England and Wales which will relieve Weybridge of certain specialised laboratory diagnoses. Each regional laboratory will be in charge of an investigation officer of the same rank as the deputy regional veterinary officer, and he will be eligible for further promotion to regional veterinary officer and above.

Obviously the central laboratories must continue their present functions. The research effort will have to be expanded and adjusted to sustain the sort of advisory and consultative services which have been outlined.



And so the State Veterinary Service, from a modest beginning at the time of the cattle plague in 1865, goes forward into a second century. The Animal Health Division may do so with pride in the achievements of its predecessors and in its own contributions, but it must be alive to the need to keep pace with changes in a developing livestock industry and ready to guide progress where its influence is pertinent, so that it may provide that service to agriculture which is its heritage.

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